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Review Article

Barriers to and enablers of diabetic retinopathy screening attendance: a systematic review of published and grey literature

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What's new?

- Diabetic retinopathy screening is effective but uptake is sub-optimal.
- Theoretical determinants (barriers and enablers) of screening attendance were identified that operate at the level of the person with diabetes (e.g. confusion between retinopathy screening and routine eye care), the healthcare professionals (e.g. lack of recommendation to screen), the healthcare system (e.g. inaccurate registers), and the wider community (e.g. lack of media coverage).
- Findings from this study will help to inform which theoretical determinants to target in interventions that seek to improve attendance at diabetic retinopathy screening.

Abstract

Aims To identify and synthesize studies reporting modifiable barriers/enablers associated with retinopathy screening attendance in people with Type 1 or Type 2 diabetes, and to identify those most likely to influence attendance.

Methods We searched MEDLINE, EMBASE, PsycINFO, Cochrane Library and the 'grey literature' for quantitative and qualitative studies to February 2017. Data (i.e. participant quotations, interpretive summaries, survey results) reporting barriers/enablers were extracted and deductively coded into domains from the Theoretical Domains Framework; with domains representing categories of theoretical barriers/enablers proposed to mediate behaviour change. Inductive thematic analysis was conducted within domains to describe the role each domain plays in facilitating or hindering screening attendance. Domains that were more frequently coded and for which more themes were generated were judged more likely to influence attendance.

Results Sixty-nine primary studies were included. We identified six theoretical domains [‘environmental context and resources’ (75% of included studies), ‘social influences’ (51%), ‘knowledge’ (50%), ‘memory, attention, decision processes’ (50%), ‘beliefs about consequences’ (38%) and ‘emotions’ (33%)] as the key mediators of diabetic retinopathy screening attendance. Examples of barriers populating these domains included inaccurate diabetic registers and confusion between routine eye care and retinopathy screening. Recommendations by healthcare professionals and community-level media coverage acted as enablers.

Conclusions Across a variety of contexts, we found common barriers to and enablers of retinopathy screening that could be targeted in interventions aiming to increase screening attendance.

Introduction

Diabetic retinopathy is a leading cause of severe sight loss in people of working age [1,2]. Although effective treatments are available [3], their success is dependent on early detection and timely referral. Diabetic retinopathy screening effectively reduces risk of sight loss; however, screening attendance is consistently below recommended levels [4–6].

Interventions that target screening behaviour are more likely to be effective if they address the determinants (barriers and enablers) of screening attendance. The Theoretical Domains Framework of behaviour change [7] proposes 14 'theoretical domains' for identifying and categorizing barriers/enablers (e.g. 'knowledge,' 'beliefs about consequences,' 'social influences'). Each domain represents a set of related constructs that may mediate behaviour change. For example, the 'social influences' domain includes the constructs 'social support,' 'group norms' and 'social comparison' [8]. The framework thus provides a theory-driven basis for investigating the potentially wide-ranging barriers to/enablers of behaviour change.

The Theoretical Domains Framework has been applied in numerous studies to identify and characterize systematically barriers to/enablers of implementation across various clinical contexts, primarily through interview and survey studies. More recently the framework has been applied in systematic reviews of barriers/enablers, as a coding framework for data synthesis, for example, in a study of barriers to the optimal clinical management of stroke [9]. Identifying barriers/enablers in the literature, framing these in terms of theoretical domains, and identifying their likely importance for screening attendance, are steps that might explain why some interventions are more effective than others. This would enable intervention designers to optimize interventions by ensuring that they target the likely determinants of screening attendance.

We aimed to gain an understanding of diabetic retinopathy screening attendance behaviour by identifying the theoretical determinants of screening attendance.

The specific objectives were to: identify the published and 'grey' literature reporting perceived barriers and enablers associated with screening attendance; extract reported barriers/enablers and categorize these according to Theoretical Domains Framework domains; and apply pre-specified criteria to identify the likely importance of Theoretical Domains Framework domains in influencing screening attendance.

Methods

A detailed protocol for this review has been published [10] and registered in PROSPERO (CRD42016032990). In brief, we included studies reporting primary data relating to modifiable factors that might hinder or facilitate retinopathy screening attendance. We included studies reported in English and conducted between January 1990 and February 2017, basing the lower date limiter on the publication of the St Vincent Declaration ('Diabetes care and research in Europe: the Saint Vincent declaration', 1990), which set a target to reduce new blindness in Europe by one-third or more, as this was arguably the catalyst for the development of diabetic retinopathy screening programmes worldwide. Studies were excluded if the reported barrier to screening was non-modifiable, for example, relating to age, gender, socio-economic status or duration of diabetes.

Six bibliographic databases were searched to identify the published literature (MEDLINE, EMBASE, PsycINFO, Web-of-Science, CENTRAL in the Cochrane Library, Proquest). An example search strategy for MEDLINE is provided in Appendix S1. Grey literature databases were also searched (e.g. OpenGrey and PsycEXTRA), alongside a Google search engine

search using the terms: 'diabetic retinopathy' AND 'screening' AND [barrier* OR 'facilitat* OR enable]. We limited the Google search to the first 15 pages. Reference lists of included studies were screened for additional studies. After removal of duplicates, one member of the research team (E.G.R.) screened all identified titles and abstracts against the inclusion/exclusion criteria. A second review author (F.L.) rescreened 300 (10%) of the titles and abstracts to check reliability. Since the inter-rater agreement was substantial (Cohens κ= 0.82) it was judged unlikely that double-checking further papers would have had a material impact on the level of agreement. Full-text copies of potentially eligible studies were obtained and a final decision was made on inclusion by consensus amongst the review team.

Data extraction and analysis

We followed analysis methods used in previous studies applying the Theoretical Domains Framework to interview transcripts from semi-structured interviews [11]. These methods follow a combined content and framework analysis approach (Fig. 1) involving four steps: 1) data extraction; 2) deductive analysis (Theoretical Domains Framework coding); 3) inductive analysis (thematic synthesis); and 4) identifying important domains.

Step 1: Data extraction

One review author (E.G.R.) identified and extracted data reporting participants' [e.g. people with diabetes and/or healthcare professionals (HCPs)] perceptions of modifiable barriers/ enablers associated with screening attendance. A second reviewer (J.G.L.) checked the accuracy of data extraction on a random 20% sample of included studies. Extracted data included participant quotations from qualitative studies, quantitative findings from questionnaire and survey studies and authors' interpretive descriptions and summaries of

results. Predictors of and associations with attendance/non-attendance reported in quantitative studies were also extracted.

Step 2a: Pilot coding exercise

In order to practise coding extracted data into theoretical domains, three pilot transcripts were coded independently by two reviewers (E.G.R. and F.L.). Any discrepancies were discussed until agreement was reached. The pilot transcripts were used to develop a Theoretical Domains Framework codebook (the content of the codebook is provided in Appendix S2).

Step 2b: Theoretical Domains Framework coding

One review author (E.G.R.) coded the data extracted from all remaining studies. Extracted data were coded according to which domain they were judged to represent, guided by the codebook. Using a process that was arguably more robust than the 20% double-coding specified in the study protocol [10], three members of the review team (E.G.R., F.L., J.J.F.) met to verify and discuss every extracted data item to assess the domain-level coding, in the context of step 3 (described below).

Step 3: Thematic synthesis

In line with a framework analysis approach, step 3 focused on sifting and sorting the data within each domain to synthesize thematically and identify emerging content themes. One review author (E.G.R.) grouped together similar data relating to perceived barriers of/enablers to screening attendance, for each of the 14 domains. Theme labels (describing broad content themes) and, where appropriate, sub-theme labels (nested within the themes, describing more detailed content) were then generated for each cluster of similar data to express these shared views. Three members of the review team (E.G.R., F.L., J.J.F.) met to

verify and discuss every extracted data item to assess: 1) their agreement with grouping of extracted data; 2) their agreement with assigned theme and sub-theme labels; and 3) whether the theme was appropriately allocated to the given domain. Disagreements were discussed until consensus was reached, and theme groups, labels and allocation of domains were revised accordingly.

Additionally, E.G.R. assigned the data within the themes as either representing barriers to or enablers of screening attendance. This was usually clear from the original papers as it was either reported in a table titled 'barriers to' or 'enablers of screening attendance' or interpreted as one or the other by the study author. Each theme/sub-theme was then classified as: 1) a barrier theme if the data within it related to barriers only (e.g. receiving insufficient notice of appointments); 2) an enabler theme if the data within it related to enablers only (e.g. support from local community groups/networks); and 3) both a barrier and an enabler theme if it related to both [e.g. (in)flexibility of choice of times/dates of appointments].

Step 4: Identifying important domains

Each domain identified in step 2 was reviewed against an established set of three 'importance criteria' [12] to determine which domains were likely to be important for influencing screening attendance: (1) *frequency* (number of studies that identified each domain; (2) *elaboration* (number of themes and sub-themes) within each domain; and (3) *'expressed importance'* (either a statement from the authors' interpretation or direct quotes from study participants expressing importance).

Quality assessment

One review author (E.G.R.) rated included studies using items from the Critical Appraisal Skills Programme Qualitative Checklist (http://www.casp-uk.net/casp-tools-checklists) and the Mixed Methods Appraisal Tool (https://www.mcgill.ca/familymed/research/projects/mmat). Mixed-methods studies were appraised using both quantitative and qualitative appraisal tools. A second review author (J.L.) independently assessed a random sample of studies (20%). Agreement was not formally assessed, but only minor differences of opinion regarding study quality were identified and resolved by discussion.

Results

Study characteristics

After removing duplicates, we screened 3194 studies and reviewed 234 full-text articles. We excluded 165 studies with reasons and included 69 studies that met our inclusion criteria (Fig. 2). Table 1 presents an overview of the characteristics of included studies. Full details of the included studies are provided in Appendix S3 and a list of excluded studies can be found in Appendix S8.

Quality of included studies

The studies were judged to be at low (46.7%), medium (8.3%) or unclear (45%) risk of bias (Appendix S4).

Deductive analysis

In total, 737 units of data were extracted: 468 qualitative (167 quotations from study participants and 301 from authors' conclusions) and 269 quantitative units (e.g. percentages of participants agreeing with a questionnaire item, or odds ratios).

Reported barriers were identified in all but one of the theoretical domains ('skills'). Enablers were identified in all but two domains ('beliefs about capabilities' and 'skills'). Overall, there were almost twice as many themes/sub-themes identified as barriers only than as enablers only (62 vs 35). Twenty-one themes/subthemes represented both barriers/enablers. Table 2 reports the frequencies of barriers/enablers identified within each domain.

Inductive analysis

Appendix S5 presents all themes and sub-themes identified within each domain, alongside frequencies, relevant studies and sample quotations. A narrative description of the themes, within domains, is presented below, for the domains that were identified as high in importance.

Importance of Theoretical Domains Framework domains

Domain frequency

The data units were coded most frequently into the following domains: 1) environmental context and resources (52 studies); 2) social influences (35 studies); 3) knowledge (35 studies); 4) memory, attention and decision processes (34 studies); 5) beliefs about consequences (26 studies); and 6) emotions (23 studies).

Level of elaboration

Approximately 82% of themes/sub-themes relating to barriers and 69% relating to enablers were captured in the same six theoretical domains (Table 2). Table 3 lists the numbers of themes and sub-themes identified within each domain.

Rank order of domain importance

In Table 3, the 14 theoretical domains are presented in rank order. In general, there was good convergence between frequency (number of studies in which the domain was evident) and elaboration (number of themes and sub-themes based on the inductive analysis).

Expressed importance

Study authors' interpretations of the study findings (e.g. in Discussion sections) articulating specific beliefs as important influences, also provided evidence of the importance of barriers/ enablers. Quotations expressing importance are presented in Appendix S7, alongside the domain they were judged to represent. For example, the following quotations from included studies represent expressed importance for the domain: 1) 'environmental context and resources' ('*Getting to and from screening appointment was important pragmatically for many patients, who had to overcome a range of issues*') and 2) 'beliefs about consequences*'* ('*The main reason for refusal was the retinal photos taken might worsen sight*'). The number of studies that identified each domain through expressed importance was counted: the higher the count, the higher the expressed importance. On this basis, important domains were: environmental context and resources (21 studies); knowledge (19 studies); memory attention and decision processes (12 studies); social influences (10 studies); beliefs about consequences (six studies); and emotions (five studies). This list corresponds well with the

list of six domains of high importance identified by the importance criteria ‘frequency’ and ‘elaboration’ (Table 3).

In summary, there was good convergence between all three criteria for identifying the importance of six theoretical domains, suggesting these domains are likely to be key mediators of screening attendance behaviour.

Thematic synthesis for domains identified as having high importance

The content themes in the domains that were identified as potentially important factors influencing screening attendance are described in further detail in the sections below, with example references.

Environmental context and resources (52 studies)

Theme: Accessibility to the screening clinic (31 studies). The theme of accessibility to the screening clinic was identified by both people with diabetes and HCPs. 'Accessibility' included issues with transport (e.g. lack/cost/poor quality) and distance to the screening clinic. In one correlational study, in an urban area, attendance was associated with living within an eight-mile radius of the screening facility and with access to public transport [13]. In several studies, distance from home to screening services was thought to improve attendance [14,15]. In two studies, mobile screening units were associated with higher attendance compared with screening appointments at high street optometrists [16,17].

Theme: Time (competing demands; 29 studies). People with diabetes often cited time constraints as a barrier to attendance. Competing demands on their time were attributable to: work commitments (e.g. finding it hard to take time off work); family responsibilities (e.g.

childcare); and clashes with other immoveable life events (e.g. holidays, religious/cultural activities. One HCP commented that: '*People go away…to the Caribbean, Africa, Asia, Pakistan, India… and because they're away they're not going to get their screening done*' [18].

Themes: Financial concerns (27 studies) and consequences of private insurance (five studies). Financial concerns, such as the cost of the eye examination/care and the cost or lack of insurance were common, especially in the studies from the USA [19,20], but attendance was sometimes not influenced by insurance [21]. Self-employed or casual employees reported costs owing to lost income when they took time off work to attend screening appointments [22,23].

Theme: Scheduling appointment issues (19 studies). Problems with scheduling appointments, including a long wait to receive an appointment and inability to get an appointment, were barriers to attendance. Three UK studies mentioned that people with diabetes had not received an invitation or had been given insufficient notice [23–25]. Some expressed a preference for appointment flexibility but, in one study, older people with diabetes preferred fixed appointments [26]. Centrally allocated appointments were perceived by some HCPs to be problematic [15], as they undermined their own attempts to bring their patients to the clinic [18].

Theme: Time (service issues; nine studies). Long waiting times on the day of the appointment and lengthy appointments were barriers to attendance. For multiple appointments some reported 'waiting around all day' [27], while long appointments could be especially problematic for people with diabetes, because of lengthy food abstinence [28].

Theme: Referral issues (eight studies). The absence of a referral was a substantial problem for some. In one UK study, a person with diabetes who normally attended her screening appointments had attempted to access screening through her general practice but was refused as she was in temporary accommodation waiting to be rehoused [28]. In some countries, people with diabetes were not referred because there was no available eye doctor [14]. Inaccurate or incomplete registers could also result in lack of referral [15,18].

Theme: Specialist diabetes services and staff (six studies). The integration of specialist diabetes services or 'one-stop-shops' was viewed as beneficial: '*if the eye appointment was on the same day as the DM [diabetes mellitus] appointment I would definitely attend*' [14]; however, inflexible or incompatible administration systems were a problem [18]. Having a specialist practice nurse was associated with increased attendance in two studies [16,29].

Social influences (35 studies)

Theme: Doctor–patient communication (25 studies). Doctor–patient communication was discussed in many studies. A recommendation by the HCP to attend screening was an enabler [30,31], and having received a recommendation from a healthcare provider to attend screening was associated with attendance [32–34]. The absence of an HCP recommendation was a barrier in other studies [35–38]. Some people with diabetes reported lack of information provision from their healthcare providers [27,30,39], especially at the point of diagnosis.

Language and/or communication style, especially for people whose first language was not the same as the HCP's, was a barrier. In some studies people with diabetes reported language

difficulties as the primary reason for not attending screening appointments [24]. In one study a participant '*didn't understand her physician and was too intimidated to ask him to slow down when conversing*' and was unaware of the recommendation to attend [22]. In some studies, participants felt that systems were in place to overcome this barrier (e.g. provision of interpreters and accompanying family members) [15,28,40]; however, HCPs noted that accompanying relatives might not have the language skills needed to interpret correctly [15].

Theme: Trust in doctors (five studies). Advice and recommendations from doctors were perceived to be an enabler in several studies, and some people with diabetes were content to rely on their doctor's advice regarding screening [30]; however, in one study, it was reported that a small number did not trust doctors [31] and another reported that low confidence in doctors was more common in non-attenders than attenders [34]. Perceived discrimination in the healthcare system was associated with longer time periods between screening visits [41]. Conversely, a study in a Canadian Aboriginal population reported that a culturally sensitive community-based clinic overcame such barriers [22].

Theme: Presence or absence of support from family members (11 studies). Family support, both practical (e.g. providing transport to the clinic) and emotional (e.g. encouragement, offering gentle reminders), was an enabler [30,31], and its absence was a barrier [42,43]. Family support was especially important in communities that traditionally rely on their family members to look after them [40] or when the person had a physical disability [38].

Theme: Encouragement/support from local community groups/networks (three studies) plus media attention and coverage (four studies). Community-based programmes fostered trust and support [22] and provided information [40,44]. Furthermore, local media (television,

newspapers, radio channels) had potential to raise awareness and promote attendance at screening, whereas lack of media attention could contribute to low attendance [28].

Theme: Stigma (three studies). Some people with diabetes spoke of social stigma or shame being attached to a diabetes diagnosis [40,44]. HCPs also spoke about the difficulties of being confronted by a person's perceptions of stigma [45].

Knowledge (35 studies)

Theme: (Lack of) awareness of illness (19 studies). Several studies reported that a lack of knowledge about diabetes, diabetic retinopathy and the link between the two was a barrier to attendance. An understanding of how diabetes can affect vision was an essential and motivating factor associated with attendance: *'If I had realised the possibility that I would suddenly go (blind), that I wouldn't realise that it was coming on, I think I would have taken more care.'* [46]. There was a significant association between believing diabetes could affect vision and attendance [43]. HCPs argued that some people with diabetes lack understanding of the link between diabetes and vision [23,47]; however, HCPs were not always happy to make the link clear, being careful not to alarm their patient: *'I would never say to someone that there is a possibility that you could go blind from diabetes*' [46].

Theme: (Lack of) awareness of screening (17 studies) and confusion between screening and routine eye tests (eight studies). Lack of awareness of the need to screen (including recommended frequency) was a barrier to attendance, and awareness was an enabler: '*On the one hand a group of over-65s had very little knowledge about why they attend for screening. They know it is important that they go, and so they keep the appointments but they did not know … that screening helped to prevent blindness*' [15]. In one study, people with diabetes

who were not able to explain why diabetic retinopathy screening is needed reported more barriers than those who could [48]. Some were not aware of the difference between diabetic retinopathy screening and routine eye tests; hence, some believed they had attended screening when they had not [24,28,33].

Theme: Education and training (eight studies). Receiving diabetes self-management or blindness prevention classes significantly increased attendance [20,49,50], whilst those who had not received education on diabetes care were screened significantly less often than those who had [51].

Memory, attention and decision processes (34 studies)

Theme: Symptoms (24 studies). The absence of symptoms often resulted in people with diabetes deciding not to attend screening [15,23,38,44,52]. This barrier was evident across different countries and screening contexts (e.g. UK, USA, Africa, Asia and Australia) and may be especially relevant for men [14]; however, even when symptoms were experienced some did not always link these to diabetic retinopathy but to an inevitable consequence of getting older [38].

Theme: Competing health problems (13 studies). Many people with diabetes experience competing health problems that can overshadow concerns with their eyes. For some, missing a screening appointment might be attributable to a temporary illness or health problem [24,25,28], but for others it was a consequence of comorbidities [26,43,53] or the burden of diabetes [18,30,40].

Theme: Forgetting (10 studies). For some people with diabetes, failure to attend screening was attributed to: forgetting to make an appointment [26], forgetting to attend [25,27,54] or forgetting whether they had previously attended [15]. Several studies alluded to HCPs' attempts to prompt or remind their patients in advance of their upcoming appointment [15,28] and some reported that reminders prompted them to maintain regular attendance [44].

Theme: Perception of people with diabetes that they have been checked elsewhere (five studies). Sometimes people believed they had been or were going to be checked elsewhere because they were transferring their eye care to another specialist [54], or their eyes had already been examined by a family physician or as part of routine eye test by an optician [28,37].

Theme: Knowing it's a routine test (three studies). An enabler was expecting screening to be part of their routine care [31,32,55].

Beliefs about consequences (26 studies)

Theme: Perceived necessity of screening (13 studies) and perception that screening provides valuable information on the health status of your eyes (seven studies). Some people with diabetes do not attend as they believe it is unnecessary [33,43,56]: '*I was told that my eyes are fine at my last screening'* [15,26], *'my diabetes is under control'* [14,38,47] and '*screening is not useful at my age*' [30,34]; however, others reported that screening will identify problems early and this was motivating [28,55,57,58]. Some reported that screening can provide reassurance that all is well [23,28,57] or that they attended screening as family members had experienced problems with diabetes or retinopathy in the past [28,31].

Themes: Short-term effects of screening (11 studies) and concerns about the harmful effect of the screening procedure (four studies). Some people with diabetes reported that screening has negative short-term effects, for example, some dislike mydriatic eye drops (given to temporarily dilate the pupils) [32,55,59], which were often uncomfortable or, in some cases, painful [28,30,38]. In one case a woman had developed a phobia of these eye drops [25].

Mydriatic drops were also inconvenient because of their temporary effects on vision; the individual was prohibited from driving until the effects of the drops had worn off or it was difficult to navigate public transport [28,32]. Some reported that screening could have long-term negative effects on vision, either from the drops or from the retinal photographs [24,60].

Emotions (23 studies)

Theme: Fear or anxiety (20 studies). For some, the fear of losing their vision was a strong incentive to attend screening [15,27,32], but, for others, fear of a diagnosis of diabetic retinopathy was a barrier [46,58,61] or fear of the screening procedure itself [25,30,48] or of a medical intervention if they were confronted with a diagnosis [30,42,62]. In one study, non-adherent participants expressed less concern about losing their vision than adherent participants [63].

Theme: Defensive responses

Defensive responses were sometimes noted. In one study, young adults who participated reported that they wanted to attend screening, but actively engaged in avoidance strategies [57]. In other studies people with diabetes simply refused to attend, without explanation [14,25,47]: '*[the patient] is refusing to even discuss his condition, so all you can do is keep sending invites*' [25].

Theme: Emotional burden of diabetes. For some, attending screening appointments could exacerbate negative emotions relating to lack of control of their diabetes, including feelings of failure, guilt, fear and anger [15,27,46].

Details of the domains and the corresponding barriers/enablers that were considered less important are provided in Appendix S6.

Discussion

We used a systematic, theory-informed and replicable approach to identifying barriers and enablers associated with screening attendance. The combined content and framework analysis identified six Theoretical Domains Framework domains as the most influential factors in screening attendance: 1) 'environmental context and resources'; 2) 'social influences'; 3) 'knowledge'; 4) 'memory, attention and decision processes'; 5) 'beliefs about consequences'; and 6) 'emotions'. Interventions that target these domains may be more likely to increase screening attendance. In contrast, three domains seemed to have the least influence on screening: 1) 'optimism'; 2) 'reinforcement'; and 3) 'skills'. Hence, we propose that interventions targeting these three domains are less likely to increase screening attendance (Tables 2 and 3).

Implications for practice

Thematic synthesis within domains resulted in specific content themes that may help to identify potential targets for future Quality Improvement interventions. The content themes were identified at multiple levels, including: the person with diabetes (e.g. confusion between screening and routine eye care); the HCP (e.g. recommendation to screen, or lack of such

recommendation, by the HCP); the healthcare system (e.g. inaccurate registers); and the wider community (e.g. lack of media coverage; Appendix S6).

Four key recommendations based on the findings from the thematic synthesis are: (1) to reduce inconvenience to people with diabetes; (2) to increase awareness of the importance of screening; (3) to increase a sense of comfort and support; and (4) to improve message content.

1) Reduce inconvenience to people with diabetes

Many of the barriers/enablers identified related to perceptions of convenience. Difficulties with transport, distance to the screening clinic, competing health and time demands, lack of instrumental/pragmatic support and scheduling appointment issues were reported to be important factors that may hinder attendance, whereas attempts to reduce inconvenience by improving accessibility, flexible appointments and integrating services were reported to facilitate attendance. Providing local screening facilities, 'one-stop shops' (integrating screening with other diabetes appointments), offering flexible appointment systems and childcare facilities, and providing transportation may therefore be advantageous.

2) Increase awareness of the importance of screening

Both people with diabetes and HCPs reported that a lack of awareness or understanding of diabetic retinopathy, diabetes and the link between the two was a barrier to attendance. Similarly, a lack of awareness of the importance of screening, the recommended frequency or a lack of targeted education were also reported to be barriers for people with diabetes, whereas providing blindness prevention programmes or general diabetes self-management education was reported to be an enabler. The perceived absence of an HCP recommendation

to attend screening and/or a lack of information provision from the HCP were also perceived barriers and therefore facilitating HCPs to provide such recommendations could potentially address this barrier. Similarly, using the local media and local community networks to improve awareness and promote attendance was reported as a potential but often untapped resource.

3) Increase sense of comfort and support among people with diabetes

Some reported barriers relating to difficulties with communicating with HCPs, a lack of trust in doctors, a lack of emotional support, and negative emotions (e.g. fear, worry). Although there were limited reports of potential enablers to overcome such barriers, there was some mention that community-based clinics, social/cultural compatibility between the person with diabetes and HCPs, and compassion from the HCP were enablers which might encourage feelings of comfort, support and trust. There is some evidence for additional benefits of using culturally competent interventions that are tailored to the needs of people from ethnic minority groups for improving diabetes-related outcomes [64].

4) Improve message content

The absence of symptoms was a commonly mentioned barrier to attendance. Furthermore, some people with diabetes perceived that screening was not necessary, especially if they felt their diabetes was under control, they were not old, or if their previous test result was clear. It would seem desirable, therefore, to provide messages that highlight the asymptomatic nature of diabetic retinopathy and make salient the potential consequences if left unchecked. Likewise, providing messages that emphasize and highlight the benefits of early detection, the safety of the procedure and the reassurance a positive result can provide would be recommended and could help in part overcome barriers around emotional fears and concerns.

In addition, a barrier exists related to the confusion between attendance at diabetic retinopathy screening and routine eye tests. Messages highlighting the difference between the two and emphasizing the importance of continuing to attend despite attendance at other eye tests could be helpful. Furthermore, messages that emphasize that retinopathy screening is a routine part of diabetes care are also recommended, as this belief was identified as an enabler. The offer of a reminder to attend diabetic retinopathy screening was also regarded as an enabler addressing this domain.

Recommendations for future research

Identifying disparities in adherence to screening was not an objective of the present review and therefore it is not possible to recommend which sub-groups/populations require the greatest attention; however, a recent review has summarized the literature from the USA and highlighted disparities in a number of sub-groups including: males; youth- vs adult-onset diabetes; specific minority populations; and low socio-economic status [65]. Future research could endeavour to identify which theoretical domains are most important for people within these sub-groups. For example, we identified only two studies that explored factors impacting young adults [30,57]. This group is not only under-researched but also at high risk of vision loss/blindness from diabetic retinopathy. In one of these studies, Lake *et al*. [30] compared the barriers and enablers among young adults with Type 2 diabetes (age 18–39 years) with those among a group of older adults with Type 2 diabetes (age ≥40 years) and found that younger adults had a higher number of barriers compared with older adults, as well as factors that appeared to be highly relevant to younger adults such as ‘social comparison with others’, ‘concerns for the impact on the family unit’, ‘unrealistic optimism’ and ‘perceived invulnerability’. Such knowledge will allow future interventions to be tailored to those most at risk.

Strengths, limitations and challenges

The combination of deductive coding (informed by a theoretical framework to guide barrier identification) and inductive analysis (to allow more granular content themes, unanticipated findings and insights from people with diabetes to emerge) is a strength of this review. Furthermore, the review identified potential influence of people with diabetes, HCPs, organizational and contextual factors on screening attendance. We were able to code all extracted data from the 69 studies into theoretical domains, thus demonstrating that the framework provides a comprehensive coverage of barriers and enablers.

Another strength was its inclusiveness. We included published and grey literature, qualitative and quantitative methodologies, perspectives of people with diabetes and HCPs', and any context and/or screening model. Although not all barriers and enablers will be relevant to all settings, the present review gives a comprehensive overview of potential factors that may influence screening attendance.

The studies in the present review predominantly identified barriers and enablers from the perspective of the person with diabetes rather than the perspective of the organization or HCP. Even the data we had from the HCPs mostly focused on their views regarding their patients' barriers.

A number of the studies were poorly described. This hampered our ability to differentiate between the perspectives of the HCP and person with diabetes or to distinguish between different sub-groups of people with diabetes. Furthermore, the data extracted and analysed in the present review were those that were reported, analysed and interpreted by the study

authors. It is possible that our data set may have been biased, in that authors may have selectively reported findings on perceived barriers/enablers that were more prevalent, interesting, or had a better fit with the stated research question. A further limitation is that the theoretical framework used was restricted in that it did not specify relationships between domains and hence the likely strength of the direct impact of barriers on behaviour is not known.

Although the majority of the title/abstract screening and quality appraisal was carried out by a single reviewer, there was excellent agreement on random subsets of studies that were checked by a second reviewer. Consequently, we do not believe that this constitutes a major limitation.

Concluding remarks

Six theoretical domains were identified as the factors most likely to be key mediators of retinopathy screening attendance behaviour. Interventions to increase screening attendance are more likely to be effective if they target these domains. Thematic synthesis identified key content themes that offer further insight into which specific issues need to be addressed [notably, accessibility of screening clinic, time (competing demands), financial concerns and scheduling appointment issues]. Future research is needed to identify which domains are most important for subgroups of people with diabetes that have been identified as most at risk.

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Competing interests

None declared.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Search strategies for phase 2 systematic review.

Appendix S2. Theoretical Domains Framework: Definitions and Examples

Appendix S3. Characteristics of the 69 included studies.

Appendix S4. Quality assessment.

Appendix S5. Themes/sub themes within each of the 14 domains from the Theoretical Domains Frameworks.

Appendix S6. Details of domains (and corresponding themes) that were considered less important.

Appendix S7. Expressed importance.

Appendix S8. Excluded studies

Appendix S9. References.

FIGURE 1 Flow diagram of steps in the analysis.

FIGURE 2 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

Table 1 Characteristics of included studies

Study characteristics	Frequencies (total: 69 studies)
Study methods	45 (65%), quantitative (e.g. questionnaires, surveys) 18 (26%), qualitative (e.g. interviews/focus groups) 6 (9%), mixed methods
Study location	30 (43%), USA 13 (19%), UK 10 (14%), Asia 6 (9%), Africa 4 (6%), Australia 3 (4%), Canada 2 (3%), Europe 1 (1.5%), South America
Publication type	56 (81%), full-text in peer-reviewed journals 5 (7%), full-text in unpublished reports/dissertations 8 (12%), abstracts/posters.
Perspective of reported barrier/enabler	53 (77%), perspective of people with diabetes 15 (22%), both people with diabetes and HCP perspectives • *n*=11, specific ethnic groups (e.g. African American; American Indian; Aboriginal Canadian; people with South-Asian or Hispanic origin) • *n*=5, people who were classified as either non- or late-attenders • *n*=3, adults (e.g. age ≥40 years) • *n*=2, younger adults • *n*=2 (7%), women only • *n*= 2, people who had been diagnosed with diabetic retinopathy • *n*=1, participant receiving treatment • *n*=1, participants in a blindness prevention programme

	• *n*=1, Medicare population • *n*=1, people with diabetes who were also hospital staff.

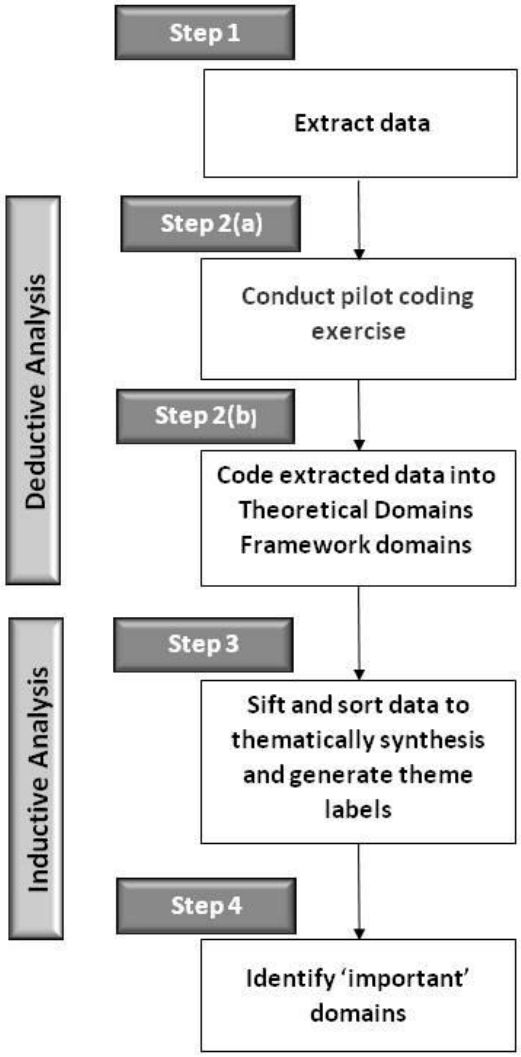
HCP, healthcare professional.

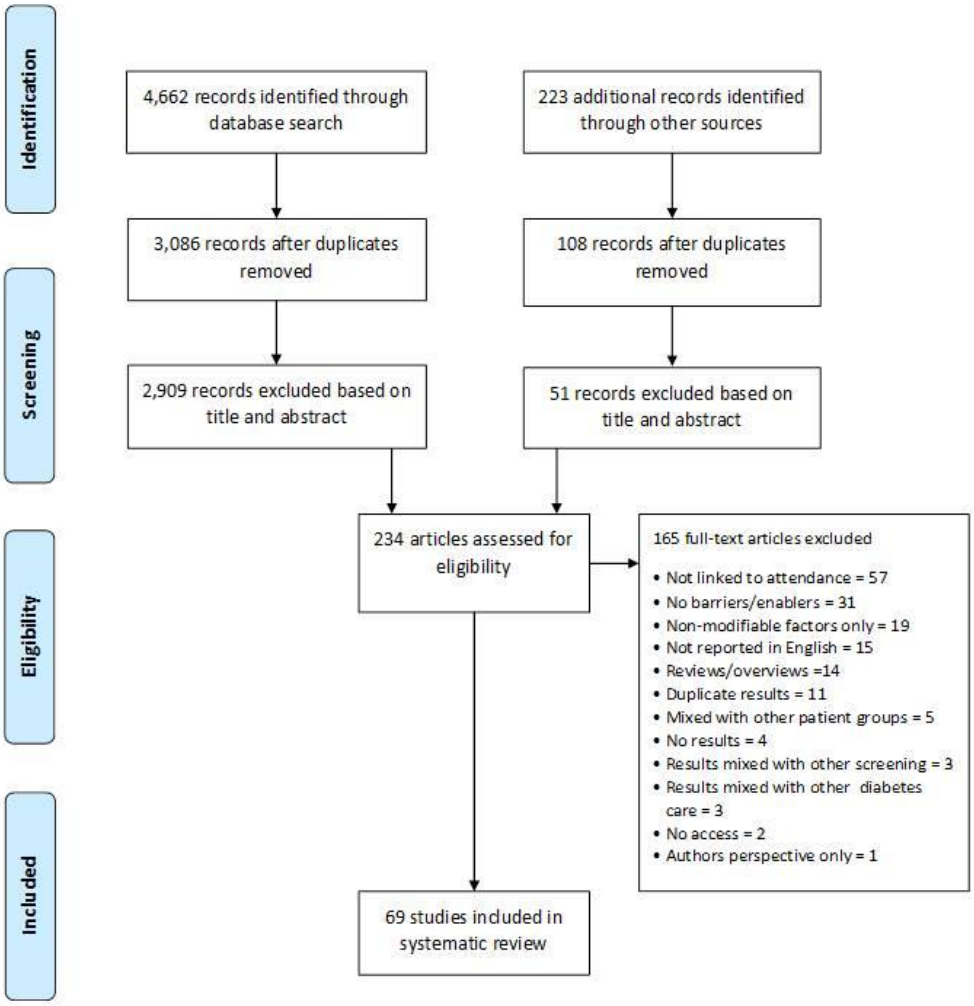
Table 2 Frequencies (number of themes/sub-themes) of barriers and enablers coded to each of the 14 domains of the Theoretical Domains Framework

Theoretical Domains Framework domain	Barriers only	Enablers only	Both barriers and enablers
Environmental context and resources	17	3	6
Social influences	6	5	5
Knowledge	4	5	6
Memory attention and decision processes	9	3	0
Beliefs about consequences	9	5	0
Emotions	6	3	1
Social professional role and identity	5	1	0
Goals	2	1	1
Beliefs about capabilities	2	0	0
Behavioural regulation	0	2	1
Intention	1	2	0
Optimism	1	2	0
Reinforcement	0	3	1
Skills	0	0	0

Table 3 Frequency and elaboration within each of the 14 Theoretical Domains Framework domains, presented in rank order from most important to least important.

Theoretical Domains Framework domain (rank order)	**Frequency**	**Level of elaboration**	
	Number of studies identified	Number of themes	Number of sub-themes
1. Environmental context and resources	52	11	23
2. Social influences	35	11	8
3. Knowledge	35	6	12
4. Memory attention and decision processes	34	6	9
5. Beliefs about consequences	26	9	10
6. Emotions	23	6	6
7. Goals	13	2	3
8. Social professional role and identity	11	3	5
9. Intention	9	2	4
10. Beliefs about capabilities	9	1	2
11. Behavioural regulation	7	3	0
12. Optimism	5	3	0
13. Reinforcement	3	2	4
14. Skills	0	0	0





Appendices

List of abbreviations

AA: African Americans

BRFSS: Behavioural Risk Factors Surveillance System

CADEES: Compliance with Annual Diabetic Eye Exams Survey

CDCP: Centers for Disease Control and Prevention

DIRECT: Diabetes Interventions Reaching & Educating Communities Together

DFE: Dilated fundus examination

DQIP: Diabetes Quality Improvement Project

DR: Diabetic retinopathy

DRS: Diabetic retinopathy screening

EC&R: Environmental context & resources

GP(s): General Practitioner(s)

HCP: Healthcare professional

HbA1c: Glycated haemoglobin

HIRD: HealthCore Integrated Research Database

KNHANES: Korean National Health and Nutrition Examination Survey

MADP: Memory, attention & decision processes

OPD: Outpatient department

PCPs: Primary Care Physicians

PDPs: Primary Diabetic Physicians

PHC: Primary Health Care

RR: Response Rate

SLCDC-DM: Survey on Living with Chronic Disease in Canada-Diabetes Component 2011

TDF: Theoretical Domains Framework

TRIAD: Translating Research into Action for Diabetes

Appendix S1. Search strategy (reproduced from Graham-Rowe 2016[1]).

MEDLINE (Ovid)

1 exp Diabetic Retinopathy/

2 ((diabet$ or proliferative or non-proliferative) adj4 retinopath$).tw.

3 diabetic retinopathy.kw.

4 (diabet$ adj3 (eye$ or vision or visual$ or sight$)).tw.

5 (retinopath$ adj3 (eye$ or vision or visual$ or sight$)).tw.

6 (DR adj3 (eye$ or vision or visual$ or sight$)).tw.

7 or/1-6)

8 exp Mass Screening/

9 exp Vision Tests/

10 exp Telemedicine/

11 exp Photography/

12 exp Ophthalmoscopes/

13 exp Ophthalmoscopy/

14 (ophthalmoscop$ or fundoscop$ or funduscop$).ti.

15 ((exam$ or photo$ or imag$) adj3 fundus).tw.

16 (photography or retinography).tw.

17 ((mydriatic or digital or retina$ or fundus or steroscopic) adj3 camera).tw.

18 ((mydriatic or digital or retina$ or fundus or steroscopic) adj3 imag$).tw.

19 screen$.tw.

20 ((eye$ or retina$ or ophthalm$) adj4 exam$).tw.

21 ((eye or vision or retinopathy or ophthalmic) adj4 test$).tw.

22 ((eye$ or retina$ or ophthalm$) adj4 visit$).tw.

23 Office Visits/

24 (telemedicine$ or telemonitor$ or telescreen$ or telehealth or teleophthalmology).tw.

25 or/8-24

26 exp Patient Acceptance of health Care/

27 exp Attitude to Health/

28 exp Health Behavior/

29 Motivation/

30 Fear/

31 exp Self Concept/

32 Personal Autonomy/

33 Self Care/

34 Behavior Therapy/

35 (barrier$ or obstacle$ or facilitat$ or enable$).tw.

36 (knowledge or skill$ or role$ or identity or capabilit$ or optimis$ or consequence$ or reinforcement or intention$ or goal$ or memory or attention or context$ or resources or emotion$).tw.

37 (decision adj2 process$).tw.

38 (social adj2 influence$).tw.

39 (behavioural adj2 regulation).tw.

40 (competence or self-efficac$ or self-confidence or incentiv$ or reward$ or anxiety fear$ or self-monitor$ or habits).tw.

41 (outcome adj2 expectanc$).tw.

42 (action adj2 plan$).tw.

43 (decision adj2 mak$).tw.

44 (social adj2 (support$ or norm)).tw.

45 ((behaviour$ or behavior$) adj3 (change$ or modif$ or activat$ or control$ or amend$)).tw.

46 (uptake or takeup or attend$ or accept$ or adhere$ or attitude$ or participat$ or facilitat$ or utilisat$ or utilizat$).tw.

47 (motivat$ or satisf$ or promot$ or consent$ or self select$ or self referr$).tw.

48 (complie$ or comply or compliance$ or noncompliance$ or non compliance$).tw.

49 (encourag$ or discourage$ or reluctan$ or nonrespon$ or non respon$ or refuse$).tw.

50 (non-attend$ or non attend$ or dropout or drop out or apath$).tw.

51 Health Education/

52 exp Patient Education as Topic/

53 exp Health Promotion/

54 exp Counseling/

55 "Attitude of Health Personnel"/

56 (health adj2 (promotion$ or knowledge or belief$)).tw.

57 (educat$ adj2 (intervention$ or information or material or leaflet)).tw.

58 Focus groups/

59 Interviews as Topic/

60 (focus adj3 group$).tw.

61 Socioeconomic Factors/

62 exp Poverty/

63 Social Class/

64 Educational Status/

65 ((school or education$) adj3 (status or level$ or attain$ or achieve$)).tw.

66 Employment/

67 Uncompensated Care/

68 Reimbursement Mechanisms/

69 Reimbursement, Incentive/

70 (insurance adj3 (health$ or scheme$)).tw.

71 (financial or pay or payment or copayment or paid or fee or fees or monetary or incentiv$ or disincentiv$).tw.

72 Healthcare Disparities/

73 Health Status Disparities/

74 exp Medically Underserved Area/

75 Rural Population/

76 Urban Population/

77 exp Ethnic Groups/

78 Minority Groups/

79 Vulnerable Populations/

80 ((health$ or social$ or racial$ or ethnic$) adj5 (inequalit$ or inequit$ or disparit$ or equit$ or disadvantage$ or depriv$)).tw.

81 (disadvant$ or marginali$ or underserved or under served or impoverish$ or minorit$ or racial$ or ethnic$).tw.

82 or/26-80

83 7 and 25 and 82)

84 limit 83 to yr="1990 -Current"

85 (ranibizumab or bevacizumab or avastin or aflibercept).ti.

86 (cataract$ or intraocular or glaucoma$ or phaco$ or photocoagulat$ or photodynamic or laser$ or vitrectom$).ti.

87 (macula$ adj2 (degener$ or oedema or edema)).ti.

88 nerve fiber layer.ti.

89 (coronary or cardiac or cardio$ or heart or myocardia$ or artery or aneurysm or atrial or echocardiography or hypertension or hypotension or stroke or pulmonary or COPD or lung$ or organ$ or smoking).ti.

90 (pregnan$ or gestational or neonat$ or perinatal or maternal or trimester or congenital or ovary or breast$).ti.

91 (kidney or liver or cirrhosis or renal or hepatitis or dialysis or pancrea$ or gastric or gastrectom$ or surg$ or duoden$).ti.

92 (blood glucose or blood pressure or ketoacidosis or hypoglycemi$ or rosiglitazone).ti.

93 (lipid$ or lipase$ or statin$ or hypercholesterolemia or microalbumin$ or albumin$ or platlet$ or plasma$ or hemoglobin$ or haemochromat$ or arterial).ti.

94 (cancer$ or carcinoma$ or neoplas$ or adenoma$ or metformin$).ti.

95 (urin$ or incontinence or bladder or constipat$ or bowel$ or faecal or colorectal or colon$).ti.

96 (gene$ or genotype$ or genome$ or genomic or phenotyp$ or biomarker$ or polymorphism$ or interleukin$).ti.

97 (cell$ or molecular or assay).ti.

98 (cystic or fibrosis or CF or tuberculosis or TB or lupus).ti.

99 (neuropath$ or nephropath$ or prematurity).ti.

100 ($arthritis or steroid$ or osteoporosis or atherosclerosis or sclerosis).ti.

101 (apnea or sleep or limb or oral$ or celiac or coeliac or skin or MRSA or anesthesia or vitamin or HIV or testosterone or erectile or schizophren$ or bipolar or antipsychotic$ or psychotic$).ti.

102 prevalence.ti.

103 or/85-102

104 84 not 103

Embase

1. exp Diabetic Retinopathy/

2. ((diabet$ or proliferative or non-proliferative) adj4 retinopath$).tw.

3. diabetic retinopathy.kw.

4. (diabet$ adj3 (eye$ or vision or visual$ or sight$)).tw.

5. (retinopath$ adj3 (eye$ or vision or visual$ or sight$)).tw.

6. (DR adj3 (eye$ or vision or visual$ or sight$)).tw.

7. or/1-6

8. exp Screening/

9. exp Vision Test/

10. Eye Examination/

11. Telemedicine/

12. Photography/

13. Eye Photography/

14. Ophthalmoscopy/

15. (ophthalmoscop$ or fundoscop$ or funduscop$).ti.

16. ((exam$ or photo$ or imag$) adj3 fundus).tw.

17. (photography or retinography).tw.

18. ((mydriatic or digital or retina$ or fundus or steroscopic) adj3 camera).tw.

19. ((mydriatic or digital or retina$ or fundus or steroscopic) adj3 imag$).tw.

20. screen$.tw.

21. ((eye$ or retina$ or ophthalm$) adj4 exam$).tw.

22. ((eye or vision or retinopathy or ophthalmic) adj4 test$).tw.

23. ((eye$ or retina$ or ophthalm$) adj4 visit$).tw.

24. (telemedicine$ or telemonitor$ or telescreen$ or telehealth or teleophthalmology).tw.

25. or/8-24

26. exp Patient Attitude/

27. exp Health Behaviour/

28. Motivation/

29. Psychological Well Being/

30. Personal Experience/

31. Psychological Aspect/

32. Social Aspect/

33. Fear/

34. Guilt/

35. Awareness/

36. Responsibility/

37. Emotionality/

38. Self Concept/

39. Personal Autonomy/

40. Self Care/

41. Behavior Therapy/

42. Behavior Change/

43. Thematic Analysis/

44. (barrier$ or obstacle$ or facilitat$ or enable$).tw.

45. (knowledge or skill$ or role$ or identity or capabilit$ or optimis$ or consequence$ or reinforcement or intention$ or goal$ or memory or attention or context$ or resources or emotion$).tw.

46. (decision adj2 process$).tw.

47. (social adj2 influence$).tw.

48. (behavioural adj2 regulation).tw.

49. (competence or self-efficac$ or self-confidence or incentiv$ or reward$ or anxiety fear$ or self-monitor$ or habits).tw.

50. (outcome adj2 expectanc$).tw.

51. (action adj2 plan$).tw.

52. (decision adj2 mak$).tw.

53. (social adj2 (support$ or norm)).tw.

54. ((behaviour$ or behavior$) adj3 (change$ or modif$ or activat$ or control$ or amend$)).tw.

55. (uptake or takeup or attend$ or accept$ or adhere$ or attitude$ or participat$ or facilitat$ or utilisat$ or utilizat$).tw.

56. (motivat$ or satisf$ or promot$ or consent$ or self select$ or self referr$).tw.

57. (complie$ or comply or compliance$ or noncompliance$ or non compliance$).tw.

58. (encourag$ or discourage$ or reluctan$ or nonrespon$ or non respon$ or refuse$).tw.

59. (non-attend$ or non attend$ or dropout or drop out or apath$).tw.

60. Health Education/

61. exp Patient Education/

62. Diabetes Education/

63. Help Seeking Behavior/

64. Patient Participation/

65. Patient Decision Making/

66. exp Health Promotion/

67. exp Counseling/

68. Health Personnel Attitude/

69. (health adj2 (promotion$ or knowledge or belief$)).tw.

70. (educat$ adj2 (intervention$ or information or material or leaflet)).tw.

71. exp Interview/

72. Qualitative Research/

73. Qualitative Analysis/

74. (focus adj3 group$).tw.

75. exp Socioeconomics/

76. Income/

77. Social Class/

78. Social Status/

79. Educational Status/

80. ((school or education$) adj3 (status or level$ or attain$ or achieve$)).tw.

81. Employment/

82. exp Reimbursement/

83. Health Insurance/

84. (insurance adj3 (health$ or scheme$)).tw.

85. (financial or pay or payment or copayment or paid or fee or fees or monetary or incentiv$ or disincentiv$).tw.

86. Health Care Disparity/

87. Health Disparity/

88. Rural Population/

89. Rural Area/

90. Urban Population/

91. Urban Area/

92. exp Ethnic Group/

93. Ethnicity/

94. Race Difference/

95. Minority Groups/

96. Vulnerable Populations/

97. ((health$ or social$ or racial$ or ethnic$) adj5 (inequalit$ or inequit$ or disparit$ or equit$ or disadvantage$ or depriv$)).tw.

98. (disadvant$ or marginali$ or underserved or under served or impoverish$ or minorit$ or racial$ or ethnic$).tw.

99. or/26-98

100. 7 and 25 and 99

101. limit 100 to yr="1990 -Current"

102. (ranibizumab or bevacizumab or avastin or aflibercept).ti.

103. (cataract$ or intraocular or glaucoma$ or phaco$ or photocoagulat$ or photodynamic or laser$ or vitrectom$).ti.

104. (macula$ adj2 (degener$ or oedema or edema)).ti.

105. nerve fiber layer.ti.

106. (coronary or cardiac or cardio$ or heart or myocardia$ or artery or aneurysm or atrial or echocardiography or hypertension or hypotension or stroke or pulmonary or COPD or lung$ or organ$ or smoking).ti.

107. (pregnan$ or gestational or neonat$ or perinatal or maternal or trimester or congenital or ovary or breast$).ti.

108. (kidney or liver or cirrhosis or renal or hepatitis or dialysis or pancrea$ or gastric or gastrectom$ or surg$ or duoden$).ti.

109. (blood glucose or blood pressure or ketoacidosis or hypoglycemi$ or rosiglitazone).ti.

110. (lipid$ or lipase$ or statin$ or hypercholesterolemia or microalbumin$ or albumin$ or platlet$ or plasma$ or hemoglobin$ or haemochromat$ or arterial).ti.

111. (cancer$ or carcinoma$ or neoplas$ or adenoma$ or metformin$).ti.

112. (urin$ or incontinence or bladder or constipat$ or bowel$ or faecal or colorectal or colon$).ti.

113. (gene$ or genotype$ or genome$ or genomic or phenotyp$ or biomarker$ or polymorphism$ or interleukin$).ti.

114. (cell$ or molecular or assay).ti.

115. (cystic or fibrosis or CF or tuberculosis or TB or lupus).ti.

116. (neuropath$ or nephropath$ or prematurity).ti.

117. ($arthritis or steroid$ or osteoporosis or atherosclerosis or sclerosis).ti.

118. (apnea or sleep or limb or oral$ or celiac or coeliac or skin or MRSA or anesthesia or vitamin or HIV or testosterone or erectile or schizophren$ or bipolar or antipsychotic$ or psychotic$).ti.

119. prevalence.ti.

120. or/102-119

121. 101 not 120

Appendix S2. Theoretical Domains Framework: definitions and examples.

TDF domain and definition	Examples related to diabetic retinopathy
Knowledge: awareness of the existence of something	In the context of this study, knowledge of the condition/scientific rationale could relate to the patient's knowledge of: • diabetes, diabetic retinopathy and the link between the two. • knowledge about rationale for screening and frequency of screening. • knowledge of the procedure and potential treatments. Knowledge may be both correct and incorrect but must relate/link to attendance
Skills: ability or proficiency acquired through practice	In the context of this study, skills/competence of the patient may include: • diabetes self-management training and education (including the DRS procedure and importance of regular attendance) Skills may be both present and absent
Social professional role and identity: a coherent set of behaviours and displayed personal qualities of an individual in a social or work setting	In the context of this study, professional role may relate to the extent that healthcare professionals feel that providing diabetic retinopathy: screening; education; prompts to attend; recommendations; appointment setting is part of their professional role Personal identity may relate to how a patient identifies with: • their illness (diabetes) • their view of a typical person who attends/does not attend screening
Beliefs about capabilities: acceptance of the truth/reality about or validity of an ability, talent or facility that a person can put to constructive use	In the context of this study, beliefs about capabilities relates to patients' judgments on their ability to attend screening including beliefs about their: • physical/mental ability or confidence to make a screening appointment and/or attend a screening appointments
Optimism: confidence that things will happen for the best or that desired goals will be attained	In the context of this study, optimism related to a patient's judgment regarding: • their susceptibility to diabetes related problems, specifically diabetic retinopathy This includes: Optimism, pessimism, unrealistic optimism.
Beliefs about consequences*:* acceptance of the truth/reality about or validity of outcomes of a behaviour in a given situation	In the context of this study, beliefs about consequences relates to patients' judgments on: • the purpose, value, and effectiveness of screening • negative/positive outcomes of screening

Reinforcement: increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus	In the context of this study, reinforcements relate to patients' judgments on: • receiving a reward/incentive for attend screening • receiving a punishment if they do not attend screening
Intentions: conscious decision to perform a behaviour or a resolve to act in a certain way	In the context of this study, intentions relate to patients' statements on: • their intention to attend/not to attend screening • their intention to continue to/stop attending screening
Goals: mental representation of outcomes or end states that an individual wants to achieve	In the context of this study, goals relate to patients' statements on: • the goals they wish to achieve from attending screening (e.g. preserve/protect vision) • competing goals (goals that might conflict with screening attendance)
Memory attention decision processes: ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives	In the context of this study, memory, attention and decision processes relate to patients' statements on: • patients ability to remember to make/attended a screening appointment • how they decide whether to attend or not • feeling overwhelmed with diabetes/multiple appointments or other life circumstances.
Environmental context and resources: any circumstances of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour	In the context of this study, environmental context and resources relates to patients' perceptions of the: • Time they have to attend • Financial resources they have to attend • Accessibility of the screening service • Resources available within the screening service, hospital, clinic. *This can include the absence or presence of resources*
Social influences: interpersonal processes that can cause an individual to change their thoughts, feeling or behaviours.	In the context of this study, social influences relate to patients' statements expressing the influence of others on attending screening. Including: • presence/absence of support from friends/family • trust of/respect in related HCPs or belief in their authority • past experiences with HCPs • community groups/wider society

Emotion: a complex reaction pattern, involving experiential, behavioural and physiological elements, by which the individual attempts to deal with a personally significant matter or event	In the context of this study, emotions relate to patients' statements of expressing their emotional reaction/state relating to: • attending a screening attendance • a potential diagnosis following a screening appointment • loss of vision/sight This could also include expression or emotions of the HCP
Behavioural regulation: anything aimed at managing or changing objectively observed or measured actions	In the context of this study, behavioural regulation relates to the patients' or HCPs' statements about steps taken to provide or use: • techniques/processes to remember/remind patients to attend screening • techniques/processes to ensure patients attend screening

Appendix S3. Characteristics of the 69 included studies

Reference, date, identification	Country/Setting	Research Objectives	Topic(s) or factor(s) of investigation (relevant to our review)	Methodological /theoretical approach (relevant to our review)	Data collection (relevant to our review)	Data analysis (relevant to our review)	Participants (Patient/HCP/Both)	Sample Size
Adriono (2011)[2] (Published (Database search)	Indonesia A tertiary facility and two community health clinics in urban area	(1) To assess the frequency of eye care (2) To assess factors associated with attendance/non-attendance	(1) Knowledge, attitudes, beliefs, awareness, concerns & practice regarding DR (2) Prompted reasons for non-attendance	Quantitative - Cross sectional	Questionnaire - unclear format & record review	(1) Logistic Regression (2) Percentages	Patients 18 + years with diagnosed diabetes(attenders and non-attenders)	Total N = 196 (99% RR) N = 160 (96.4% RR of subset of non-attenders)
Al-Alawi (2016)[3] (Published) (Database search)	Saudi Arabia Tertiary eye Hospital	To evaluate level of knowledge, attitudes, & barriers to DRS	Perceptions of barriers to DRS	Quantitative - Cross sectional	Questionnaire – closed format (Face-to-face)	Percentages	Healthcare staff who have diabetes	N = 45 (30% RR)
Al-Malki (2009)[4] (Unpublished - MSc dissertation) (Google search)	Qatar All diabetes clinics in PHC	To understand knowledge/attitudes of DRS among people with diabetes and HCPs To explore patients' understanding of their health seeking behaviour and barriers to their compliance with DRS	Reported barriers/enablers to compliance with DRS	Mixed methods - Cross sectional Descriptive	Questionnaire-mixed format	(1) Frequencies (2) Pre-specified themes	Patients attending primary healthcare diabetic clinics (included attenders and non-attenders at DRS)	N = 289 -barrier data (RR = not reported) N = 186 - enabling data (RR = 64.4%)
Applebee (2012)[5] (Unpublished report) (Google search)	UK No specific setting	To identify barriers/enablers that affect access to eye care services in Bradford	Identified motivations and barriers to screening and ideas for improving DRS	Qualitative – Descriptive Multiperspective	Focus groups (topic guide) Semi-structured interviews	Themes	Adults - Pakistani decent with diabetes (attenders/non-attenders) who had been invited to access Bradford DRS service Service Providers and managers in primary and secondary eye care services	Interviews: N = 7 (Patients) N = 10 (service providers) Focus Groups: N = 5 (patients only)
Arora (2013)[6] (Published) (Database search)	Canada Community-based clinic	To determine whether eye care, provided in a culturally-sensitive community-based clinic, could overcome social/cultural barriers	Economic, geographic, societal & cultural barriers	Qualitative – Descriptive Satisfaction review Multiperspective	Interviews – unclear structure	Thematic Analysis	(1) Patients - Aboriginal Canadians diagnosed with diabetes (2) HCP (nurses) (3) Stakeholders-program administrators, spiritual liaison of the community	(1) N= 5 (2) N = 2 (3) N = 3

Bell (2011)[7] (Published) (Database search)	USA Rural South-Eastern North Carolina Unclear setting	To examine the association of medical scepticism and diabetes management among rural older adults	The association between medical scepticism & measures of diabetes management behavior (e.g. attendance at dilated eye exam)	Quantitative-Cross sectional	Questionnaire – closed format (face to face)	Multivariate Analysis	African American, American Indian and white older 60 + years diagnosed with diabetes	N = 564 (Uncelar RR)
Byun (2013)[8] (Published) (Known to authors)	Korea No specific setting	To identify factors associated with DRS & nephropathy	The association between diabetic care education & DRS	Quantitative - Cross sectional National population data	Interview data from KNHANES IV Interviews – structured (face-to face)	Logistic Regression	Patients 30 + years diagnosed with diabetes	N = 1,288 (Selected)
Buonaccorso (1999)[9] (Published) (Database search)	USA	To report the process of a quality improvement project. To report the Identification of barriers to DRS attendance	Reported barrier	Qualitative - Evaluation of a QI intervention Multiperspective	Focus groups – open format Interviews – open format	Narrative description	Physicians from internal medicine, family practice and ophthalmology specialties. Patients with diabetes	N = 9 Physicians – focus group N = 50 patients (telephone interviews)
Cano (2007)[10] (Published Abstract only) (Known to authors)	Paraguay	To estimate the prevalence of DR and to explore the health-seeking behaviour of diabetes patients	Reported barriers/enablers to compliance with DRS	Mixed Methods – Cross sectional Descriptive	Focus groups	A thematic framework was developed for the qualitative analysis	Patients with diabetes (with visual impairment due to retnopathy and without visual impairment)	Unclear N for two focus groups
Centers for Disease Control and Prevention (2010)[11] *(Published)* (Database search)	USA No specific setting	(1) To assess the use of professional eye care (2) To report reasons for not receiving recommended follow-up care for DR	Reported reasons for not receiving recommended follow-up care for diabetic retinopathy	Quantitative – Follow-up State population data	Questionnaire data from BRFSS – 19 US states (2006-2008) – unclear s Interview – structured (telephone)	Percentages	Patients - women 40+ years with self-reported diabetes (attenders and non-attenders)	N = 7,377 (Total selected) N = 322 (sub-set of selected non-attenders)
Chou (2014)[12] (Published) (Database search)	USA No specific setting	To examine barriers to receiving recommended eye care	Reported main reasons for non-attendance	Quantitative – Cross sectional State population data	Questionnaire data from BRFSS-22 US States (2006-2010) – unclear format Interview – structured (telephone)	Categories	Patients 40+ years with self-reported diagnosed diabetes who had not visited eye provider in preceding 12 months.	N = 6,640 (Selected)

Dervan (2008)[13] (Published) (Database search)	Ireland General diabetesclinics in two hospitals	(1) To assess whether patients were receiving regular DRS (2) To examine factors influencing screening uptake	(1) Knowledge of & attitudes to diabetic retinopathy (2) Physician recommendation	Quantitative – Cross sectional	Questionnaire – mixed format	Odds Ratio & Percentages	Adult patients due to attend a diabetes clinic	N = 209 (77% RR) N = 22 (sub-set of non-attenders)
Fisher (2016)[14] (Published) (Database search)	USA New York & Los Angles	To obtain information about adherence & non-adherence to DM eye examinations among insured patients to understand the barriers to routine dilated eye examinations, & to identify ways to improve the quality of care for these patients.	Reported common barriers to routine DM eye exams	Qualitative – Descriptive Multiperspective	Focus Groups - unclear structure	Qualitative Content Analysis	Patients with DM (adherent & non-adherent) HCP identified from HIRD.	N = 29 patients; N = 18 HCP (9 Physicians & 9 ophthalmologists)
Gala (2013)[15] (Published - Abstract only) (Database search)	USA No specific setting	To examine the impact of diabetes self-management education (DSME) on preventive care practices	Association between DSME and obtaining annual dilated eye examinations	Quantitative – Cross sectional	Questionnaire - unclear format (data taken from BRFSS – 2010)	Odds Ratio	Adult patients with type 2 diabetes	N = 1,183,476 (Selected from BRFSS)
Griffin-Shirley (2004)[16] (Published) (Database search)	USA Ophthalmology clinic affiliated with a medical school	(1) To describe the demographic & clinical characteristics of those who sought eye care at an ophthalmology clinic (2) Identify barriers to ophthalmic care	Reported barriers to obtaining dilated fundus examinations	Quantitative – Cross sectional	Interviews - unclear structure (face-to-face)	Percentages	Hispanic adults with diabetes (attenders and non-attenders)	N = 94 (21.66% RR) both attenders & non-attenders
Hartnett (2005)[17] (Published) (Database search)	USA Eye clinic in medical Centre	(1) To assess inadequate DRS at a large indigent clinic (2) Explore perceived barriers	(1) Barriers/incentives (2) Understanding of diabetic eye recommendations; (3) methods used for education & communications & (4) recommendations for improving care	Qualitative – Descriptive Multiperspective	Focus groups - structured (patients) Interviews - structured (key informants)	Narrative (Codes)	Patients diagnosed with diabetes & PDPs (including PCPs, internists, & endocrinologist) & ophthalmologists	N = 17 patients N = 22 physicians (9 ophthalmologist & 13 PDPs)
Hatef (2015)[18] (Published) (Database search)	USA No specific setting	(1) To assess how well a managed care organization performed annual DRS in a Medicaid population (2) Identify barriers to completion	Modifiable factors assessed to increased likelihood of completion (e.g. financial incentives)	Quantitative - Cross sectional	Healthcare claims data	Logistic Regression	Medicaid patients with diabetes	N = 8902 (selected from Healthcare Claims Data) (N = 3838 in 2010 & N = 5064 in 2012)
Heisler (2003)[19] (Published)	USA No specific setting	To explore associations between patients' assessments of their diabetes self-management &	Association between patients' assessment of their diabetes self-management & receiving an eye examination	Quantitative – Cross sectional	Questionnaire – unclear format (DQIP data)	Logistic Regression	Veteran diabetes patients	N = 1032 (data from medical records, RR = 88%))

(Database search)		glycaemic control/receipt of recommended diabetes services						
Hipwell (2014)[20] (Published) (Database search)	UK Three screening programme regions	To examine the experiences of patients, HCP & screeners; their interactions with & understanding of DRS & how these influence uptake	Perceived antecedents to attendance & non-attendance at DRS	Qualitative – Descriptive Multiperspective	Interview - semi-structured	Thematic Analysis	Patients (Regular & non-regular attenders HCP (Primary care [PC} & screening professionals)	N= 38 patients (22 regular-screeners, 16 non-regular) N = 24 HCP (15 PC & 9 screeners)
Hossen (2015)[21] (Unpublished - Abstract only) (Google Search)	Bangladesh No specific setting - Rural district	(1) To estimate the prevalence of diabetic retinopathy (2) Identify the barriers for screening for DR in rural areas	Reported barriers to DRS - reasons for refusal	Quantitative Prospective – cohort	Unclear for barriers data	Narrative	Adults 30 + years with diabetes	N = Unclear for non-attenders
Hurrell & Donohoe (2012)[22] (Unpublished report) (Known to authors)	UK No specific setting	To identify barriers/enablers that affect access to eye care services in Glasgow	Identified motivations and barriers to screening and ideas for improving DRS	Qualitative – Descriptive Multiperspective	Focus groups (topic guide) Semi-structured interviews	Themes	Adults - Pakistani decent with diabetes (attenders/non-attenders) Other = Service Providers and managers in primary and secondary eye care services	N = 35 (patients) N = 13 (Other)
Hwang (2015)[23] (Published) (Database search)	Canada No specific setting	To examine associations between socioeconomic factors & eye screening	Association between eye screening & reports of discussion of diabetic complications with HCPs & private insurance	Quantitative – Cross sectional	Questionnaire – unclear format (SLCDC-diabetesdata)	Logistic Regression	Adults aged 20 + years with self-reported diabetes	N = 2323 (selected from survey data)
Jingi (2014)[24] (Published-abstract only) (Database search)	Cameroon Hospital	Provide baseline data on the factors influencing eye-care services provision and utilisation	Associations between modifiable factors and eye care utilization	Quantitative – Cross sectional	Interview – unclear structure	Percentages & Correlations	Patients with diabetes	N = 52 (Unclear RR)
John (2014)[25] (Published) (Goggle search)	UK Unclear setting	To explore and describe the barriers & incentives to accessing DRS	(1) Understanding about DRS; (2) encountered barriers; (3) social network conversations regarding DRS; (4) recommendations of how to increase DRS	Qualitative - Descriptive	Focus groups – topic guide	Thematic Analysis	Patients of South Asian origin diagnosed with diabetes & diabetic retinopathy screeners	N = 68 (total)
Jones (2011)[26] (Published - abstract only) (Database search)	UK General practices in one screening programme	To understand factors at general practice level affecting uptake of retinal screening	Associations between practice-related factors & uptake of DRS	Quantitative Cross sectional	Interviews - unclear structure (telephone)	Logistic Regression	General practices in one screening programme	N = 77 (Unclear RR)

Karter (2003)[27] (Published) (Database search)	USA No specific setting	To investigate the effect of out-of-pocket expenditures on the utilization of recommendeddiabetes prevention services	The associations between higher out-of-pocket costs and lower use of annual dilated eye exams	Quantitative - Prospective cohort	Various administrative data sources (part of a wider study -TRIAD)	Logistic Regression	Patients 18 + years with diabetes	N = 11,922 (selected from wider study)
Khandekar (2011)[28] (Published) (Database search)	Oman No specific setting	(1) To present outcomes of a defaulter retrieval system (2) Report reasons for 'no shows'	Reported reasons from patients with diabetic retinopathy for their non-attendance – reported to eye care staff	Qualitative - Descriptive	Interviews – unclear structure (telephone)	Narrative overview	Eye care staff reporting on defaulting patients	N = 328(66.4% RR of defaulter)
Kiran (2013)[29] (Published) (Database search)	Canada No specific setting	To assess whether the delisting of routine eye examinations has the unintended consequence of decreasing DRS attendance	The association between delisting of routine eye examinations and DRS attendance	Quantitative - Interrupted – times series (Change in trends)	Various administrative data sources	Segmented Linear Regression	Adults 40+ years with diabetes	N = 331026 (1998) - selected N = 851 193 (2010) - selected
Kizor-Akaraiwe (2016)[30] (Published) (Database search)	Africa Screening centre in Nigeria	To determine the prevalence, awareness & determinants of DR among people with DM who attended a screening centre	Reported reasons for not having had previous DR screening	Quantitative Cross sectional	Questionnaire – Unclear structure Interviewer administered	Percentages	Patients with DM who visited a DR screening centre in Enugu in July 2015	N = 70 patients that had not had prior DR screening. (RR 100%)
Kovarik (2016)[31] (Published) (Google search)	USA An inner city community teaching hospital	(1) To determine the prevalence & risk factors of diabetic retinopathy in the inpatient diabetic population (2) Determine barriers to eye examinations & treatment	Reported barriers to eye examinations	Quantitative - Cross sectional	Interview - unclear structure	Frequencies	Inpatients with diabetes	N = unclear number interviewed
Lake (2017)[32] (Published) (Known to authors)	Australia No specific setting	To explore barriers & enablers associated with retinal screening among young adults with T2D	Reported themes relating to barriers & enabler to DRS uptake	Qualitative – Based on the Theoretical Domain Framework	Interview – semi-structure	Framework Analysis (TDF)	Young adults (18-39 years) with type II DM Older adults (40+ years) with type 11 DM	N = 10 (younger adults) N = 20) (older adults)
Laver (2013)[33] (Published - abstract only) (Database search)	UK	(1) To understand the experiences of young adult who do not attend DRS (2) Identify factors that influence their non-attendance	Reported factors that influence non-attendance	Qualitative – A modified Grounded Theory approach	Interviews – semi-structured	Modified Grounded Theory techniques	Young adults (20-25 years) diagnosed with Type I diabetes	N = 9

Lee (2014)[34] (Published) (Database search)	USA No specific setting	To estimate the prevalence of & factors associated with dilated eye examination compliance	The association between distance to eye screening facility & quality of access to public transport with compliance with dilated eye examination	Quantitative – Cross sectional	Various administrative data sources	Logistic Regression	Patients diagnosed with diabetes	N = 200 -Selected
Lee (2000)[35] (Published) (Database search)	Australia No specific setting	To examine eye care practices of people with diabetes who had not previously accessed eye care services on a regular basis	Reported reasons for non-compliance among people diagnosed with diabetic retinopathy	Quantitative - Follow-up	Questionnaire – unclear format	Narrative - list of reasons	Patients with DR who did not return for follow-up screening	N = 11 (unclear RR)
Lewis (2007)[36] (Published) (Database search)	UK One rural district general hospital & one urban tertiary teaching hospital	To determine what factors may influence diabetic patients' attendance at eye clinics	Knowledge, beliefs, attitudes, social norms and reported enabling factors that may influence attendance at eye clinics	Qualitative – Descriptive Multiperspective	Interviews – semi-structured Focus Groups – topic guide Observations	Thematic Analysis (Results presented using the BASNEF model)	Patients with diabetes (Attenders no diabetic retinopathy & Non-attenders with retinopathy) HCPs: two GPs; four nurses; four ophthalmologist; one retinal photographer; two reception staff; one medical social worker	N = 24 (Patients interviewed N = 35 (Patients in focus groups) N = 14 (HCPs interviewed)
Lindenmeyer (2014)[37] (Published) (Database search)	UK 9 purposively selected GP practices in 3 screening programme areas	To identify factors contributing to high or low patient uptake of DRS	Reported factors relating to screening uptake	Qualitative – Case base Multiperspective	Interviews – Semi-Structured	Case-based analysis	Patients with diabetes - low attenders, Medical Practice Staff (GPs, nurses), Administrative Practice Staff' Screener	N = 38 (Patients); N = 8 (Medical staff); N = 9 (Admin staff); N = 9 (Screener)
Livingstone (1998)[38] (Published) (Database search)	Australia Two rural areas	To identify potential health promotion strategies to encourage people with diabetes to take preventive eye health care measures	Recommendations of types of strategies needed to promote the eye screening service	Qualitative – Descriptive Multiperspective	Focus Groups – unclear structure	Themes	Patients with diabetes; Ophthalmologist, optometrist, GPs, DM educators/ nurses, epidemiologists, representatives of diabetes Service Organisations	N = 50 (total) including N = 21 (Patients)
Lu (2016a)[39] (Published) (Database search)	USA A large city safety-net clinic	To examine disparities in perceived barriers to DRS between two vulnerable populations	Reported barriers	Quantitative – Cross sectional	Questionnaire unclear format	Percentages	Hispanic & African American (AA) patients with diabetes	N = 98 (Total) (RR not reported) N = 71 Hispanics N = 27 AA
Lu (2016b)[40] (Published) (Database search)	USA Los Angles	To compare perceived barriers to DR screening among low-income patients & their health care providers & provider staffers.	The comparison of eight barriers rated by patients versus those rated by providers & their staffers	Quantitative Cross sectional Multiperspective	Questionnaire Likert scale Barriers derived from the literature	Percentages, chi square	Patients (primarily of Hispanic & African decent) with diabetes & providers/staffers at a safety-net clinic where annual diabetic retinopathy screening rates were low	N = 101 patients (RR = 92%) N = 44 providers & staffers (RR = 80%)

Mackenzie (2015)[41] (Unpublished - Poster abstract only) (Database search)	UK Two large primary care (GP) surgeries in different areas	To investigate screening from the patients' & HCP perspective to: (1) determine motivations to attend & reasons for non-attendance (2) to investigate knowledge of diabetic retinopathy & management issues for HCPs	Reported barriers & motivations	Mixed Methods – Cross sectional Descriptive Multiperspective	Interviews - semi-structured (patients) (telephone) Questionnaire - unclear format (HCPs) Group meeting - unclear format (HCPs)	Percentages Thematic Analysis	Patients with diabetes (attenders & non-attenders – absent two or more years) HCPs – members of GP staff	N = 24 patients N = Unreported HCPs
Massaro (2010)[42] (Published) (Database search)	USA Ophthalmology department in Medical Centre	To determine the acceptability of digital retinal photography among patients with DM who were not getting annual eye exams	Reported barriers to annual ophthalmic examinations, patients' perspectives of DM & digital scans	Quantitative – Cross sectional Acceptability study	Questionnaire - unclear format	Percentages	Patients aged 18 + years with diabetes who were overdue for eye screening	N = 87 (RR not reported)
Moreton (2017)[43] (Published) (Known to authors)	Scotland UK	To investigate variables at the demographic & primary car practice levels that influence the uptake of diabetic retinopathy screening	The association between primary care practice level variables & uptake of diabetic retinopathy screening	Quantitative – Cross sectional	Data extracted from management software from one screening programme. A telephone survey of high-street optometrist	Generalized linear mixed models	Patients registered on one diabetic retinopathy screening programme	21797 within 79 general practices
Moss (1995)[44] (Published) (Database search)	USA Primary Care across 11 counties	Follow-up study: (1) To estimate compliance with guidelines on ocular examinations for people with diabetes & examine differences between those who have and have not complied (2) To examine factors that affect compliance & reasons for non-compliance	Reported barriers and enablers to compliance	Quantitative – Follow-up Population study	Unclear data collection methods (non-attenders in last two years were asked questions at follow-up examination)	Frequencies	Patients with diabetes who participated in baseline examination (older & younger onset)	N =765 (younger onset group) N = 533 (older onset group) These are probability samples selected from baseline sample: N = 1210
Mumba (2007)[45] (Published) (Database Search)	Africa Diabetic clinic	Measure current use of the eye department & the increase in eye examinations following education about diabetic eye disease	Reported modifiable factors associated with having had a dilated fundus exam (i.e. Knowledge,	Quantitative – Prospective cohort	Questionnaire - mixed format	Logistic Regression	Patients with diabetes, aged 18 + years	N = 316 (RR 100%)

Nathaniel (2015)[46] (Published)	Africa Tertiary health facility in Nigeria	To evaluate the knowledge of patients with diabetes receiving care in hospital Ascertain how many of them have had their eyes examined	Association between Awareness of eye complications and attendance at an eye examination	Quantitative - Cross sectional	Questionnaire – semi structured (Interview administered)	Chi-square	Patients with DM attending an Endocrinology clinic	N = 225 (RR 100%)
Njambi (2012)[47] (Published) (Google Search)	Kenya Provincial Hospital	(1) To determine the prevalence of diabetic retinopathy (2) To describe the relationship between diabetic retinopathy and risk factors (3) To identify barriers to uptake	Reported barriers to uptake	Quantitative Cross sectional	Questionnaire – closed format	Frequencies	Patients with diabetes (type I & II), 12+ years attending the diabetic clinic	N = 253 (RR not reported)
Onakpoya (2010)[48] (Published) (Database search)	Nigeria Tertiary Hospital	(1) To determine the prevalence of dilated eye examinations (2) To determine factors affecting dilated eye examinations	Reported reasons for no previous dilated eye exams	Quantitative Cross sectional	Questionnaire – unclear format (Reasons for not having had a dilated eye exam were noted)	Percentages	Patients with type I DM receiving treatment in tertiary hospital	N = 83 (includes all diabetes patients who attended clinic during study period)
Orton (2013)[49] (Published) (Database search)	UK No specific setting	(1) To assess equity of access to DRS (2) To determine predictors for poor uptake	Reported barriers to uptake	Mixed Methods - Cross sectional Descriptive Health Equity Audit	Questionnaire – unclear format (Postal) Interviews – semi- structured (telephone)	Questionnaire used as a guide for interviews Themes	Geographically & ethnically diverse population of patients from one county Patients with diabetes who were invited for DRS	N = 435 (RR = 43%) questionnaire N = 32 (RR = 64%) interviews
Paksin-Hall (2013)[50] (Published) (Database search)	USA No specific setting	To examine what variables contribute to diabetes patients not receiving annual dilated eye examinations	Modifiable variables: The relationship between a history of attendance at diabetic management class and attendance at annual dilated eye exam	Quantitative – Cross sectional National survey data	Questionnaire - unclear format (data taken from BRFSS: 2009)	Logistic regression	Patients aged 18 + years diagnosed with diabetes (Type I & II)	N =52,386 (total) N = 24,198 (sub-section reported to have had a DRS in last year)
Pasagian-Macaulay (1997)[51] (Published)	USA Recruited from large county-funded tertiary care centre	(1) Assess ophthalmic knowledge (2)Identify beliefs regarding (a) barriers, (b) benefits, (c) concerns and (d) self-efficacy related to receiving	Reported barriers to receiving recommended ophthalmic screening	Quantitative – Cross sectional	Questionnaire – unclear format (telephone)	Percentages	Low income suburban women with diabetes	N = 150 (sample RR = 61.7% & contact RR = 94.3%)

(Database search)		recommended ophthalmic screening						
Peek (2011)[52] (Published) (Database search)	USA	To investigate the impact of perceived discrimination (PD) and various diabetes health outcomes	The association between PD and prior eye exam interval	Quantitative – Cross sectional Nation survey data	Questionnaire – unclear format (data taken from 8 states from BRFSS: 2004-2008	Logistic regression	Patients aged 18 + years with diabetes	N = not provided
Peng (1994)[53] (Unpublished PhD thesis) (Database search)	Taiwan Eye clinic in memorial hospital	To explore possible factors associated with the receipt of a DRS exam	(1) The association between reported modifiable factors & receipt of DRS exam (2) Reported reasons given for non-attendance &	Quantitative – Cross sectional Guided by Health Belief Model	Questionnaire – closed format	Logistic regression Percentages	Patients 18 + years with diabetes (type I & II) who visited the out-patient eye clinic	N = 275 total (RR = 88%) N = 110 (non-attenders only)
Puent (2004)[54] (Published) (Database search)	USA No specific setting	To determine reasons some diabetes patients do not receive a dilated eye examination each year	Reported reasons (barriers) for non-compliance	Quantitative – Cross sectional Chart Review	Questionnaire – mixed format (telephone)	Percentages	Patients with diabetes identified from chart review	N = 43 non-attenders (RR = 43%)
Rajput (2015)[55] (Published - abstract only) (Goggle search)	USA No specific setting	To estimate the proportion of insured persons with diabetes who do/do not receive annual dilated eye exams Identify barriers to dilated eye exams and interventions to improve compliance	Reported barriers to exams and suggested interventions to improve compliance	Qualitative - Descriptive Multiperspective	Focus groups – unclear format	Rank ordered themes	Patients with diabetes (type II) HCPs = PCPs & Ophthalmologists	N = 29 - patients N = 18 HCPs (9 PCPs & 9 Ophthalmologists)
Roy (2004)[56] (Published) (Database search)	USA No specific setting	(1) Determine the frequency of annual dilated eye examinations, health insurance, use of an ophthalmologist (2) Determine factors associated with having a dilated eye exam by an ophthalmologist	Reported reasons for not having an eye exam by an Ophthalmologist during previous year The association between reported modifiable factors and having a dilated eye exam	Quantitative – Cross sectional	Interview – Structured	Percentages Odds Ratio	African American patient with diabetes (type I) identified from 31 hospitals located in 7 counties	N = 722 (RR 82.5%)
Sachdeva (2012)[57] (Published) (Known to authors)	UK Two surgeries within one large GP practice	Determine the factors that influenced attendance for routine DRS Compare demographic/socio-economic data of attenders and non-attenders	Reported reasons for non-attendance at DRS	Quantitative – Cross sectional	Questionnaire – mixed format (telephone)	Percentages	Patients with diabetes who failed to attend DRS	N = 198 –non attenders (RR= 86.45%)

Schoenfeld (2001)[58] (Published) (Database search)	USA No specific setting	(1) To describe baseline patterns of adherence to vision care guidelines for diabetes in the diabetic retinopathy awareness programme (2) To evaluate factors associated with non-adherence	The association between reported modifiable factors and non-adherence	Quantitative – cross sectional	Interview – unclear structure (Phone)	Logistic Regression	Patients with diabetes, 18 + years, resident in one county in New York Recruited through multimedia community-wide campaign	N = 2308 total N = 813 non-adherent sub-set
Sheppler (2014)[59] (Published) (Database search)	USA Two primary care clinics	To identify variables that predict adherence with annual eye examinations	The association between reported modifiable factors and non-adherence	Quantitative – questionnaire development Based on a review of the literature, and the Health Belief Model	Questionnaire – Mixed format (CADEES)	Logistic Regression	Adult patients with diabetes already enrolled on an ongoing clinical trial	N = 316 (RR not reported)
Shukla (2016)[60] (Published) (Google search)	India Hospital based (11 Cities in nine states)	(1) Assess perception of care (2) Assess challenges faced in availing care mong people with diabetes (Barriers)	Reported barriers in accessing care for diabetic retinopathy	Quantitative – Cross sectional Cross state hospital survey	Interview – semi open-ended	Percentages	Patients with diabetes attending an eye clinic	N = 376 (RR not reported)
Silver (2006)[61] (Published) (Known to authors)	USA Focus Groups - Five locations in Indian country Interviews – at the Alaska Native Medical Center & at a national conference	Learn about & measure: (a) current awareness & understanding of diabetes management; (b) benefits of early detection for eye disease; (c) barriers to receiving/accessing diabetes related eye healthcare; (d) motivators for behaviour change & (e) preferred communication channels	Barriers to receiving or accessing diabetes-related eye healthcare & motivators for behaviour change	Qualitative – Descriptive Formative research for an outreach strategy Multiperspective	Focus groups - unclear format Interviews – In-depth	Themes	Focus Groups = American Indians & Alaska Natives with diabetes (mixed age groups) Interviews = Key Informants (e.g. diabetes educators, eye care professionals, nurses, health educations, tribal council leaders etc.)	N = 70 (Patients) N = 58 (Key Informants)
Strutton (2016)[62] (Published) (Google search)	UK On diabetic eye screening programme	To identify explanations for why patients had never attended a screening appointment	Explanations for why patients had never attended a screening appointment	Qualitative - Service evaluation	Interview - unclear format (Phone)	Thematic framework analysis	Patients registered on screening programme who had never attended	N = 146 (RR = 57%)
Tapp (2004)[63] (Published)	Australia No specific setting	(1)To study the frequency of examining for DM eye and foot complications	The association between reported modifiable factors and regular screening	Quantitative - Cross sectional Complications study	Interview – unclear format	Logistic regression	Participants with diabetes Identified via a wider population-based study	N = 396 (RR = 83.37)

(Database search)		(2) To study factors associated with regular screening						
Van Eijk (2012)[64] (Published) (Database search)	The Netherlands 20 Dutch general practices	To examine incentives and barriers to attend DRS	The association between barriers/incentives and attendance	Mixed methods - Cross sectional Descriptive	Questionnaire – closed format Focus groups -	Odds ratios Themes	Patients with diabetes 18+years (type I & II)	N = 1891 (RR = 58.4%) for questionnaire N = 30 (across four focus groups
Walker et al (1997)[65] (Published) (Database search)	USA New York metropolitan county medical centre serving a low income population	To assess knowledge and health beliefs related to preventing diabetic eye complications among a sample of African-Americans to guide the development of a health promotion intervention	Reported Incentives and barriers	Mixed methods – Cross sectional Descriptive	Questionnaire – Mixed format - closed and open-ended questions (Via telephone)	Percentages Themes	African American patients with diabetes. Random sample from county hospital	N = 67 (RR 64%)
Wang (2010)[66] (Published) (Database search)	China One urban tertiary hospital, one urban community hospital & one rural hospital	To assess the use of eye care. To assess predictors of eye care	The association between reported modifiable factors & having an eye exam	Quantitative – Cross sectional	Questionnaire – closed format	Logistic Regression	Patients with diabetes, 18+ years	N = 824 (RR92.7%)
Will (1994)[67] (Published) (Database search)	USA	To follow-up on people with DM participating in blindness prevention programs from 1985-1987	The association between reported modifiable factors and having an eye exam	Quantitative – Prospective cohort	Questionnaire – unclear format (telephone)	Logistic Regression	Patients with DM who had participated in one of four blindness prevention programmes (N = 569).	N = 414 (RR = 73%) out of original sample
Yuan (2007)[68] Unpublished MSc dissertation (Reference list)	China One retinal OPD of Shanxi Eye Hospital	To explore the socio-economic risk factors and barriers to access eye care services of late presenting diabetic retinopathy (patients in Shanxi province.	The barriers to access eye care services.	Qualitative – Descriptive Multiperspective	Interviews – (open-ended questions) Focus groups (open-ended questions)	Thematic analysis	Patients with late presenting diabetic retinopathy Eye care providers	N = 15 patients N = 6 eye care providers
Yuen (2012)[69] (Published) (Database search)	USA No specific setting	Factors associated with preventive care practice among adults with diabetes	The association between reported modifiable factors and having an eye exam	Quantitative – Cross sectional	Questionnaire – unclear format	Logistic Regression	Patients with diabetes, residing in the UK Recruited from: a) pool of Gullah speaking African-Americans in South Carolina & b) thirteen other US states	N = 253 (convenience sample –RR not reported)

Zhang (2009)[70] (Published) (Database search)	USA	To examine (a) diabetic retinopathy, (b) dilated eye exams and (c) eye care education among African Americans before & after a community-level public health intervention	The association between receiving eye care education and receipt of dilated eye exam	Quantitative – prospective cohort Population	Questionnaire-unclear format (data taken from project DIRECT)	Logistic Regression	Patients with diabetes in 1996-1997 and 2003-2004 in two communities in North Carolina	N = 1289 – total (RR not reported) N = 617 from 1997 N = 672 from 2004

Appendix S4. Excluded studies (*n*=165)

Study	Reason for exclusion
Anon (2013)[71]	Review/overview (checked references)
Anon (2014)[72]	Barriers/enablers not investigated
Anon (2015)[73]	Duplicate results
Anon (2008)[74]	Duplicate results
Anon (2010)[75]	Review/overview (checked references)
Anon (2008)[76]	Not linked to attendance - MSc thesis:
Aguilera et al (2011)[77]	Not linked to attendance at DRS
Al-Athamneh et al (2014)[78]	Not linked to attendance at DRS
Al Rasheed (2017)[79]	Not linked to attendance at DRS
Al Zarea (2016)[80]	Barriers/enablers not investigated
Ali (2016)[81]	Barriers/enablers not investigated
Alswat (2015)[82]	Not linked to attendance at DRS
Aurangzebm (2006)[83]	No access
Bachmann (1996)[84]	Barriers/enablers not investigated
Bae et al (2008)[85]	Non-modifiable factors only
Bamashmus et al (2009)[86]	Not linked to attendance at DRS
Baumeister et al (2015[87]	Non-modifiable factors only
Bek (1998)[88]	Barriers/enablers not investigated
Behhamou et al (2013)[89]	Not reported in English
Bell (2011)[90]	Duplicate result
Bischoff (1993)[91]	Barriers/enablers not investigated
Bundesmann & Kaplowitz (2011)[92]	Barriers/enablers not investigated
Byrne (2015)[93]	Not linked to attendance at DRS
Cetin et al (2013)[94]	Not linked to attendance at DRS
Cheng et al (2015)[95]	Not linked to attendance at DRS
Chin et al (2001)[96]	Not linked to attendance at DRS
Christian et al (2016)[97]	Not linked to attendance at DRS
Choe et al (2012)[98]	Non-modifiable factors only
Chou (2017)[99]	Non-modifiable factors only
Cumba (2010)[100]	No results presented
Cupples (1992)[101]	Not linked to attendance at DRS
Dan et al (2015)[102]	Non-modifiable factors only
Dandona et al (2001)[103]	Not linked to attendance at DRS
D'Lugoff & McCarter (2005)[104]	Barriers/enablers not investigated
Eiser et al (2001)[105]	Not linked to attendance at DRS
El Hajj (2013)[106]	Not linked to attendance at DRS
Ellish et al (2007)[107]	Mixed with other patient groups
Facey (2002)[108]	Barriers/enablers not investigated
Fathy et al (2016)[109]	Review/Overview (checked references)
Ferraro et al (2006)[110]	No results presented
Fisher et al (2015)[111]	Duplicate results
Foster et al (1996)[112]	Barriers/enablers not investigated
Foster et al (2016)[113]	Not linked to attendance at DRS
Funatsu (2002)[114]	Not reported in English
Funatsu (2004)[115]	Not reported in English
George et al (2013)[116]	Not linked to attendance at DRS
Gillibrand (2000)[117]	Not linked to attendance at DRS
Gillibrand & Holdich (2010)[118]	Review/overview (checked references)
Gower et al (2013)[119]	Mixed with other patient groups

Grimshaw et al (2014)[120]	Not linked to attendance at DRS
Gulliford et al (2010)[121]	Non-modifiable barriers only
Hall (2016)[122]	Not linked to attendance at DRS
Hark et al (2012)[123]	No results provided
Harvey et al (2006)[124]	Not linked to attendance at DRS
Haw et al (2015)[125]	Review/overview (checked references)
Hazin et al (2011)[126]	Review/overview (checked references)
Hayden (2012)[127]	Review/overview (checked references)
Hipwell et al (2013)[128]	Duplicate results
Hiroyama et al (2002)[129]	Not reported in English
Hiss (1996)[130]	Can't separate out DRS from other diabetic care
Hung et al (2015)[131]	Not linked to attendance at DRS
Hussain et al (2016)[132]	Not linked at attendance at DRS
Hwang (2012)[133]	Non-modifiable factors only
Inada et al (2001)[134]	Not reported in English
Inoue et al (2002)[135]	Not reported in English
Jones & Nichols (2007)[136]	Not linked to attendance at DRS
Judah (2016)[137]	Barriers/enablers not investigated
Keeffe (2003)[138]	No results reported
Khandekar (2012)[139]	Barriers/enablers not investigated
Kitaoka et al (1996)[140]	Not reported in English
Kliner et al (2012)[141]	Non-modifiable barriers only
Kobayashi (2002)[142]	Not reported in English
Keenum et al (2016)[143]	Results mixed with other diabetic care
Krein et al 2008)[144]	Not linked to attendance at DRS
Kupitz et al (2014)[145]	Not linked to attendance at DRS
Kurji et al (2013)[146]	Barriers/enablers not investigated
Lake (unknown)[147]	Duplicate results
Lamoureux et al (2012)[148]	Barriers/enablers not investigated
Lawton et al (2005)[149]	Not linked to attendance at DRS
Leamon et al (2014)[150]	Duplicate results
Lee et al (2001)[151]	Barriers/enablers not investigated
Lee et al (2013)[152]	Duplicate results
Leese et al (2008)[153]	Non-modifiable factors only
Lewis (2011)[154]	Review/overview (checked references)
Lewis (2015)[155]	Review/overview (checked references)
Li et al 137(2009)[156]	Mixed with other patient groups
Lin et al (2016)[157]	Review/overview (checked references)
Lindenmeyer et al (2013)[158]	Barriers/enablers not investigated
Liu & Chen (2014)[159]	Not linked to attendance at DRS
Maberley et al (2002)[160]	Non-modifiable factors only
MacLennan et al (2014)[161]	Barriers/enablers not investigated
Massin & Kaloustian (2007)[162]	Barriers/enablers not investigated
McCarty et al (1999)[163]	Not linked to attendance at DRS
McGhee et al (2012)[164]	Barriers/enablers not investigated
Mehta (2004)[165]	Not linked to attendance at DRS
Memon et al (2015)[166]	Barriers/enablers not investigated
Mirkiewicz-Sieradzka (2000)[167]	Not reported in English
Mistry et al (2015)[168]	Barriers/enablers not investigated
Mtuya et al (2016)[169]	Results mixed with other diabetic care
Mukamel et al (1999)[170]	Non-modifiable factors only
Muller et al (2006)[171]	Non-modifiable factors only
Munoz et al (2008)[172]	Not linked to attendance at DRS
Murgatroyd et al (2006)[173]	Not linked to attendance at DRS
Nagi et al (2009)[174]	Barriers/enablers not investigated

Navuluri (2000)[175]	Not linked to attendance at DRS
Newcomb et al (1992)[176]	Review/overview (checked references)
Nguyen (2016)[177]	Review/overview (checked references)
Nsiah-Kumi et al (2009)[178]	Review/overview (checked references)
Ohno et al (1996)[179]	Not written in English
Olusanya et al (2016)[180]	Results mixed with other patient groups
Onakpoya et al (2016)[181]	Non-modifiable factors only
Orton et al (2011)[182]	Duplicate results
Ovenseri-Ogbomo et al (2013)[183]	Not linked to attendance at DRS
Paz et al (2006)[184]	Non-modifiable factors only
Peek et al (2011)[185]	Duplicate results
Philis-Tsimilas et al (2009)[186]	Barriers/enablers not investigated
Pilling (2015)[187]	Not linked to attendance at DRS
Preti et al (2007)[188]	Not linked to attendance at DRS
Quigley et al (2002)[189]	Results mixed with other screening or eye disease
Raman et al (2006)[190]	Not linked to attendance at DRS
Reid et al (2013)[191]	Barriers/enablers not investigated
Reno et al (2013)[192]	Not linked to attendance
Richardson (2012)[193]	Did not cover DRS
Saadine et al (2008)[194]	Non-modifiable factors only
Sachdeva et al (2010)[195]	Duplicate results
Scanlon et al (2012)[196]	Barriers/enablers not investigated
Scanlon et al (2013)[197]	Not perspective of patient or HCP or predictive
Sikivou (2000)[198]	No access
Sloan et al (2004)[199]	Non-modifiable factors only
Sloan et al (2014)[200]	Mixed with other patient groups
Smith et al (2006)[201]	Barriers/enablers not investigated
Stanga et al (1999)[202]	Barriers/enablers not investigated
Streja & Rabkin (1999)[203]	Barriers/enablers not investigated
Sculpher (1993)[204]	Not linked to attendance at DRS
Takahashi & Takahashi (2001)[205]	Not reported in English
Taylor (2017)[206]	Review/Overview (checked references)
Thapa et al (2012)[207]	Barriers/enablers not investigated
Ting et al (2011a)[208]	Not linked to attendance at DRS
Ting et al (2011b)[209]	Not linked to attendance at DRS
Ting et al (2011c)[210]	Not linked to attendance at DRS
Trento et al (2002)[211]	Not linked to attendance at DRS
Trivedi et al (2005)[212]	Not linked to attendance at DRS
Tsui et al (2015)[213]	Barriers/enablers not investigated
Trudinger & Niblett (2012)[214]	Did not cover diabetic retinopathy screening
Varma et al (2008)[215]	Non-modifiable factors only
Wadge et al (2015)[216]	Not linked to attendance at DRS
Wakae et al (2000)[217]	Not reported in English
Wakae et al (2003)[218]	Not reported in English
Waked et al (2006)[219]	Not reported in English
Wallace (2013)[220]	Not linked to attendance at DRS
Wang et al (1999)[221]	Non-modifiable factors
Waqar et al (2012)[222]	Non-modifiable factors
Weiss et al (2015)[223]	Not linked to attendance at DRS
Wiggins et al (2015)[224]	Not linked to attendance at DRS
Williamson & O'Connor (2013)[225]	Barriers/enablers not investigated
Wilson & Eezzuduemhoi (2005)[226]	Barriers/enablers not investigated
Woodward et al (2015)[227]	Not linked to attendance at DRS
Wright et al (2001)[228]	Not linked to attendance at DRS

Yan et al (2012)[229]	Results mixed with other screening or eye disease
Yang et al (2017)[230]	Not linked to attendance at DRS
Yeo et al (2012a)[231]	Not linked to attendance at DRS
Yeo et al (2012b)[232]	Not linked to attendance at DRS
Yoshimeto et al (2004)[233]	Not reported in English
Yuen et al (2010)[234]	Results mixed with other screening or eye disease
Xiong et al (2015)[235]	Not linked to attendance at DRS

Appendix S5. Quality assessment of 69 included studies

Quality assessment of qualitative studies and the qualitative components of the mixed methods studies

Author/Date	Q1: Was the research design appropriate to address the aims of the research?	Q2: Was the recruitment strategy appropriate to the aims of the research?	Q3: Was the data collected in a way that addressed the research issue?	Q4: Was the data analysis sufficiently rigorous?	Q.5: Has the relationship between researcher and participants been adequately considered?	Risk of bias (Low/medium/high)
Al-Malki (2009)[4]	Yes	Yes	Unclear	Unclear	Unclear	**Unclear**
Applebee (2012)[5]	Yes	Yes	Yes	Yes	Unclear	**Low**
Arora (2013)[6]	Yes	Unclear	Unclear	Yes	Unclear	**Unclear**
Buonaccorso (1999)[9]	Yes	Yes	Yes	Unclear	Unclear	**Low**
Cano (2007)[10]						Abstract only
Fisher (2015)[14]	Yes	Yes	Yes	Unclear	Unclear	**Low**
Hartnett (2005)[17]	Yes	Yes	Yes	Unclear	Unclear	**Low**
Hipwell (2014)[20]	Yes	Yes	Yes	Yes	Unclear	**Low**
Hossen (2015)[21]						Abstract only
Hurrell & Donohoe (2012)[22]	Yes	Yes	Yes	Yes	Unclear	**Low**
John (2014)[25]	Yes	Yes	Yes	Unclear	Unclear	**Low**
Khandekar (2011)[28]	Unclear	Unclear	Unclear	Unclear	Unclear	**Unclear**
Lake (2017)[32]	Yes	Yes	Yes	Yes	Unclear	**Unclear**
Laver (2013)[33]						Abstract only
Lewis (2007)[36]	Yes	Yes	Yes	Yes	Yes	**Low**
Lindenmeyer (2014)[37]	Yes	Yes	Yes	Yes	Unclear	**Low**
Livingstone (1998)[38]	Yes	Yes	Yes	No	Unclear	**Medium**
Mackenzie (2015)[41]						Abstract only
Orton (2013)[49]	Yes	Yes	Unclear	Unclear	Unclear	**Unclear**
Rajput (2015) - [55]						Abstract only
Silver (2006)[61]	Yes	Yes	Yes	Unclear	Unclear	**Low**
Strutton (2016)[62]	Yes	Yes	Unclear	Yes	Yes	**Low**

van Eijk (2012)[64]	Yes	Yes	Yes	Unclear	Unclear	**Low**
Walker (1997)[65]	Yes	Yes	Yes	Unclear	Yes	**Low**
Yuan (2007)[68]	Yes	Unclear	Yes	Unclear	Unclear	**Unclear**

Quality assessment of qualitative studies and the quantitative components of the mixed methods studies

Author/Date	Q1: Is the sampling strategy relevant to address the quantitative research question?	Q2: Is the sample representative of the population under study?	Q3: Are measurements appropriate? (clear origin, or validity known, or standard instrument)	Q4: Is there an acceptable response rate? (60% or above)	Risk of bias (Low/medium/high /unclear)
Adriono (2011)[2]	Unclear	Unclear	Unclear	Yes	**Unclear**
Al-Alawi (2016)[3]	Unclear	Unclear	Unclear	No	**Unclear/Meduim**
Al-Malki (2009)[4]	Yes	Unclear	Unclear	Unclear	**Low/Unclear**
Bell (2011)[7]	Yes	Yes	Yes	Yes	**Low**
Byun (2013)[8]	Yes	Yes	Yes	Yes	**Low**
Cano (2007)[10]					Abstract only
CDCP (2010)[11]	Yes	Yes	Unclear	No	**Medium**
Chou (2014)[12]	Yes	Yes	Unclear	No	**Medium**
Dervan (2008)[13]	Yes	Unclear	Unclear	Yes	**Low/unclear**
Gala (2013)[15]					Abstract only
Griffin-Shirley (2004)[16]	Yes	Unclear	Yes	No	**Unclear**
Hatef (2015)[18]	Yes	Yes	Yes	Yes	**Low**
Heisler (2003)[19]	Yes	Yes	Yes	Yes	**Low**
Hwang (2015)[23]	Yes	Yes	Yes	Yes	**Low**
Jingi (2014)[24]					Abstract only
Jones (2011)[26]					Abstract only
Karter (2003)[27]	Yes	Yes	Yes	Yes	**Low**
Kiran (2013)[29]	Yes	Yes	Yes	Yes	**Low**
Kizor-Akaraiwe (2016)[30]	Yes	Yes	Unclear	Yes	**Low**
Kovarik (2016)[31]	Yes	Yes	Unclear	Unclear	**Low/unclear**
Lee (2014)[34]	Yes	Unclear	Yes	No	**Medium**
Lee (2000)[35]	Yes	Unclear	Unclear	Yes	**Low/unclear**
Lu (2016a)[39]	Unclear	Unclear	Unclear	Unclear	**Unclear**

Lu (2016b)[40]	Yes	Yes	Yes	Yes	**Low**
Mackenzie (2015)[41]					Abstract only
Massaro (2010)[42]	Low	Unclear	Unclear	Unclear	**Unclear**
Moreton (2017)[43]	Yes	Yes	Yes	Yes	**Low**
Moss (1995)[44]	Unclear	Yes	Unclear	Unclear	**Unclear**
Mumba (2007)[45]	Yes	Unclear	Unclear	Yes	**Low/unclear**
Njambi (2012)[47]	Yes	Unclear	Unclear	Unclear	**Unclear**
Onakpoya (2010)[48]	Yes	Unclear	Unclear	Yes	**Low/unclear**
Orton (2013)[49]	Yes	Yes	Unclear	No	**Medium**
Paskin-Hall (2013)[50]	Yes	Unclear	Yes	Unclear	**Low/unclear**
Pasagian-Macaulay (1997)[51]	Yes	Yes	Yes	Yes	**Low**
Peek (2010)[52]	Yes	Unclear	Yes	Yes	**Low**
Peng (1994)[53]	Yes	Unclear	Yes	Unclear	**Low/unclear**
Puent (2004)[54]	Yes	Unclear	Unclear	No	**Medium/unclear**
Roy (2004)[56]	Yes	Unclear	Unclear	Yes	**Low/unclear**
Sachdeva (2012)[57]	Unclear	Unclear	Unclear	Yes	**Unclear**
Schoenfeld (2001)[58]	Yes	Yes	Unclear	Unclear	**Low/unclear**
Sheppler (2014)[59]	Yes	Yes	Yes	Unclear	**Low**
Shukla (2016)[60]	Yes	Unclear	Unclear	Unclear	**Unclear**
Tapp (2004)[63]	Yes	Unclear	Unclear	Yes	**Low/unclear**
van Eijk (2012)[64]	Yes	Yes	Yes	Yes	**Low**
Walker (1997)[65]	Yes	Yes	Yes	Yes	**Low**
Wang (2010)[66]	Yes	Yes	Unclear	Yes	**Low**
Will (1994)[67]	Yes	Yes	Unclear	Yes	**Low**
Yuen (2012)[69]	Unclear	Unclear	Unclear	Unclear	**Unclear**
Zhang (2009)[70]	Yes	Unclear	Unclear	Yes	**Low/unclear**

Appendix S6. Themes/sub themes within each of the 14 domains from the Theoretical Domains Frameworks.

Domain: Environmental Context and Resources (52 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Accessibility of screening clinic **(31 studies)**	**Transportation** **21 studies** Studies: Lindenmeyer[37]; Hartnett[17]; Peng[53]; Sachdeva[57]; Strutton[62]; Hipwell[20]; Chou[12]; Pasagian-Macaulay[51]; Kovarik[31]; Khandekar[28]; Njambi[47]; Applebee[5]; Mackenzie[41]; Fisher[14]; Griffen-Shirley[16]; CDCP[11]; Al-Malki[4]; Yuan[68]; Lee[34]; Walker[65]Lu(b)[40]	21	0	*Defaulting patient stated that the main barriers to presenting for an appointment were lack of transport.*…[Author interpreted summary (Khandekar 2011[28])] - Barrier *The quality of public transportation access was strongly associated with compliance. Odds Ratio = 1.34 (CI 1.07 – 1.68); P< 0.05).* [Statistical data (Lee 2014[34])] - Barrier
	Distance to clinic **12 studies** Studies: Shukla[60]; Lee[34]; Moss[44]; Peng[53]; Al-Malki[4]; Al-Alawi[3]; Lindenmeyer[37]; Jingi[24]; Hipwell[20]; Chou[12]; Griffen-Shirley[16]; CDCP[11].	12	0	*Among those reporting barriers, the distance was the most important barrier (65.1%).* [Statistical data (Shulka 2016[60])] - Barrier *Those living eight or more miles from the screening facility were significantly less likely to be compliant relative to those living within eight miles.* [Predictive - Author analysis (Lee 2014[34])] - Barrier
	Improving accessibility **4 studies** Studies: Applebee[5]; Arora[6]; John[25]; Jones[26]	0	4	*Tele-ophthalmology helps to overcome financial and geographic barriers for patients, as they only travel to the urban tertiary care centre if treatment is needed.* [HCP quote (Arora 2013[6])]- Enabler *People told us that it helps them when services are provided locally.* [Author interpreted summary (Applebee 2012[5])] - Enabler

Time (Competing demands) (29 studies)	**Work (Career)** **15 studies** Studies: Mackenzie[41]; Strutton[62]; Rajput[55]; Lewis[36]; Hartnett[17]; Al-Alawi[3]; Griffen-Shirley[16]; Arora[6]; Hipwell[20]; Laver[33]; Pasagian-Macaulay[51]; Sachdeva[57]; Hurrell & Donohoe[22]; Yuan[68]; Walker[65]	15	0	*It is hard to get time off from work to go to an eye exam (8.7%).* [Statistical data (Pasagian-Macaulay[51])]- Barrier *My family have a mining factor, I have been working there as a counter, it was very busy, I put the diabetes beside me, never care about it* [Patient quote (Yuan 2007[68])] - Barrier *…Can't take a day off from work and you need a whole day to go to the clinic* [Patient quote (Walker 1997[65])]- Barrier
	Generally, busy **14 studies** Studies: Sachdeva[57]; Moss[44]; Peng[53]; van Eijk[64]; Pasagian-Macaulay[51]; Massaro[42]; Roy[56]; Kovarik[31]; Lake[32]; Al-Malki[4]; Hossen[21]; Walker[65];Fisher[14]; Lu(b)[40]	14	0	*I had a whole list. I wrote down all the things that I needed to do and I basically crossed off the ones that could wait…I suppose, I thought another month wouldn't make too much of a difference and that there were so many other things that needed to be done right away.* [Patient quote (Lake 2017[32])] - Barrier *Having no time to attend was more frequent in non-attenders than attenders. Odds ratio +0.5 (CI 0.3-0.7).* [Predictors - Author analysis (van Eijk[64])] - Barrier
	Family (e.g. childcare) **6 studies** Studies: Griffen-Shirley[16]; Massaro[42]; Strutton[62]; Hurrell & Donohoe[22]; Walker[65]; Lake[32]	6	0	*Patient…said It's difficult to attend because her daughter as had a break down and she is looking after her children.* [HCP quote (Strutton 2016[62])] - Barrier *It's not as if going in (only concerns) yourself…you've got family worries… to be there, for your children.* [Patient quote (Hurrell & Donohoe 2012[22])]- Barrier
	Clashes with specific occasions **5 studies** Studies: Arora[6]; Lindenmeyer[37]; Sachdeva[57]; Adriono[2]; Lake [32]	5	0	*People go away…to the Caribbean, Africa, Asia, Pakistan India…You find out in retrospect where they've been, and because they're away they're not going to get their screening done* [HCP quote (Lindenmeyer 2014[37])] - Barrier *The nurse administrators explained that 'appointments were almost unanimously missed if conflicting with the time of a pow-wow or other major cultural activity'* [Service provider (Arora 2013[6])] - Barrier

Financial Concerns (27 studies)	**Costs of eye care/exam** **25 studies** Studies: Rajput[55]; Griffen-Shirley[16]; Pasagian-Macaulay[51]; Hartnett[17]; Kovarik[31]; Njambi[47]; Chou[12]; Jingi[24]; Moss[44]; Adriono[2]; Applebee[5]; Al-Alawi[3]; Arora[6]; Karter[27]; Yuan[68]; Will[67]; Peng[53]; Roy[56]; Shukla[60]; Lake[32]; Massaro[42]; Walker[65] Fisher[14]; Lu(b)[40]; Kizor-Akaraiwe[30]	25	0	*Money. Insurance does not always cover the exam. Covers the visit. But not the test. I have to see so many doctors, including specialists. So there's a lot of co-pays.* [Patient quote (Rajput 201[55])] - Barrier *The two most common reasons given by approximately 60% of the respondents were that they count not pay for an examination and…*[Statistical data (Will 1994[67])] - Barrier *Older adults mentioned the cost of screening, but commonly indicated: "I can afford that" (ID06POA). In contrast, cost was a prominent barrier for young adults, some of whom reported experiencing "financial stress" (ID38_YA).'* [Authors interpreted summary (Lake 2017[32]) – Barrier
	Lack of insurance/cost of insurance **4 studies** Studies: Puent[54]; Chou[12]; Massaro[42]; Walker[65]	4	0	*Barriers to getting an annual eye examination: …Insurance coverage of office visits/testing (37%).* [Statistical data (Massaro 2010[42)] - Barrier *Cost or lack of insurance was most often the main reason given by women (40.1%), persons aged 40-64 years old (38.4%), those with incomes…*[Statistical data (Chou 2014[12])] - Barrier
	Loss of earnings (Self-employed) **N = 2 studies** Studies: Arora[6]; Hurrell & Donohoe[22]	2	0	*I am self-employed, it (attending appointments) costs me money.* [Patient quote (Hurrell & Donohoe 2012[22])] - Barrier *…all the time spent traveling results in a loss of my wages, so sometimes it's easier not to see the doctor in the city.* [Patient quote (Arora 2013[6])] - Barrier
Scheduling appointment issues (19 studies)	**Long wait times to receive an appointment** **6 studies** Studies: Lindenmeyer[37]; Hartnett[17]; Hipwell[20]; Hurrell & Donohoe[22]; Pasagian-Macauly[51]; Applebee[5].	6	0	*All sources agreed that poor access to care, particularly the 1-year wat for an appointment, was a barrier.* [Author interpreted summary (Hartnett 2005[17])] - Barrier *Well before the appointment I phone and they said no, they'd got no appointments for the next three months…The following year again the same thing, I phoned when I had the letter, they said three months' waiting.* [Patient quote (Hipwell 2014[20])] - Barrier

	(In)Flexibility /choice of times/dates **9 studies** Studies: Applebee[5]; Al-Malki[4]; John[25]; Orton[49]; Hurrell & Donohoe[22]; Lindenmeyer[37]; Hipwell[20;] Lake[32]; Fisher[14]	2	6	*If eye clinic was opened in the evening I would attend.* [Patient quote (Al-Malki 2009[4])] - Enabler *We like it where you can ring once you have had reminder letter. You can then have an appointment to suit you no too far ahead* [Patient quote (Applebee 2012[5])] - Enabler *Professional felt that expecting patients to make their own DRS appointment downgraded its perceived importance to patients, or was not patients' responsibility. This was exacerbated by the perceived rigidity of the appointment-booking system in another region.* [Author interpreted summary (Hipwell 2014[20])] - Barrier
	Inability to get an appointment **6 studies** Studies: CDCP[11]; Chou[12]; Dervan[13]; Moss[44]; Peng[53]; Walker[65]	6	0	*Reservation is troublesome (6.5%).* [Statistical data (Peng 2010[53])]- Barrier *The most commonly reported reasons for not receiving eye care in the preceding 12 months were…could not get appointment (6.4%).*[Statistical data (Chou 2014[12])] - Barrier
	Receiving insufficient notice of appointment **3 studies** Studies: Hurrell & Donohoe[22]; Strutton[62]; Sachdeva[57].	3	0	*Reasons for no-attendance included…(18%) said they did not receive the invitation.* [Statistical data (Sachdeva 2012[57])] - Barrier *…Some also stated practical difficulties in relation to being about when the appointment came and also problems with the reliability of the post and /or post reaching them (especially when the individual lived in a flat).* [Author interpreted summary (Hurrell & Donohoe 2012[22])] - Barrier
	Centralised systems **2 studies** Studies: Lindenmeyer[37]; Applebee[5].	2	1	*Some of the practices…just hadn't got any sort of system at all. So a centralised system is a good thing.* [Author interpreted summary (Lindenmeyer 2014[37])] - Enabler *Some service providers identified outpatient's appointments systems as problematic*. [Author interpreted summary (Applebee 2012[5])] - Barrier

Time (Service issues) (9 studies)	**Length of wait time (e.g. Delays)** **6 studies** Studies; van Eijk[64]; Pasagian-Macaulay[51]; Hartnett[17]; Lewis[36]; Al-Malki[4]; Walker[65]	6	0	*Responses indicated that a long wait in the doctor's office/clinic was the greatest barrier.* [Author interpreted summary (Pasagian-Macaulay (1997[51])] - Barrier Having to wait over 30 mins more likely in non-attenders than attenders. *Odds Ratio=0.5 (CI: 0.4-0.7).* [Predictive- Author analysis (van Eijk 2012[64])]- Barrier
	Lengthy appointments **5 studies** Studies: Peng[53]; Hipwell[20]; Fisher[14]; Hartnett[17]; Walker[65]	5	0	*In one region, appointments lasting for several hour at optometry practices were potentially a deterrent. One patient recognised that lengthy food abstinence was particular inappropriate for diabetes patients.* [Author interpreted summary (Hipwell 2014[20])] - Barrier *Participants were concerned that multiple appointments scheduled at one time caused some patients to wait all day to see a physician.* [Author interpreted summary (Hartnett 2005[17])]- Barrier
Referral Issues (8 studies)	**Lack of referral (including no access to doctor)** **6 studies** Studies: Al-Malki[4]; Onakpoya[48]; Hipwell[20]; Al-Alawi[3]; CDCP[11]; Chou[12]	6	0	*…Lack of referral by attending physician [45.8%] were the main barriers to having previous dilated eye exams*. [Statistical data (Onakpoya 2010[48])] - Barrier *I tried to get a new appointment at the eye clinic but the doctor refused to see me without a new referral.* [Patient quote (Al-Malki 2009[4])] - Barrier
	Inaccurate register **2 studies** Studies: Lindenmeyer[37]; Applebee[5].	2	0	*Practice administrators aimed to add their patients to the DESP lists as soon as possible by letter or fax. Systematic checks of the lists before the annual screening appointment or at the annual QOF audit time were used as a backstop. However, patients could fall through the net.* [Author interpreted summary (Lindenmeyer 2014[37])] - Barrier *We did not receive any letters from the BRI apart from the one stating that she had been discharge.* [Patient quote (Applebee 2012[5])] - Barrier
Specialist diabetes services (6 studies)	**Integration of services** **5 studies**	1	4	*The GPs also believed that the local diabetes educators and local diabetes clinics were vital for the dissemination of information.* [Author interpreted summary (Livingstone 1998[38])] - Enabler

	Studies: Livingstone[38]; Hipwell[20]; Al-Malki[4]; Lindenmeyer[37]; Jones[26]			*The greatest barriers were inflexible or incompatible administrative systems.*…[Author interpreted summary (Lindenmeyer 2014[37])] - Barrier
	Specialist staff **2 studies** Studies; Jones[26]; Tapp[63]	0	2	Presence of a nurse with special responsibility for diabetes associated with increased uptake. *Odds Ratio = 1.13(CI: 1.00-1.29).* [Predictive - Author analysis (Jones 2011[26])] - Enabler Visiting a diabetes nurse in the previous 12 months was an independent predictor of having had an eye examination. *Odds Ratio = 1.89 (1.20-2.95); P = 0.012.* [Predictive - Author analysis (Tapp 2004[63])] - Enabler
Consequences of private insurance (5 studies)	**No sub-theme** **5 studies** Studies: Rajput[55]; Hwang[23]; Paksin-Hall[50]; Sheppler[59]; Kiran[29]	2	3	Those with health insurance had increased odds of undergoing a dilated eye examination within the past year. *Adjusted Odds Ratio = 1.75 (CI: 1.42-2.16).* [Predictive - Author analysis (Paskin-Hall 2013[50])] - Enabler *The delisting of routine eye examinations for health adults in Ontario had the unintended consequence of reducing publicly funded retinopathy screening for people with diabetes* [Author interpreted summary (Kiran 2013[29])] - Barrier
Availability of dedicated screening resources (2 studies)	**No sub-themes** **2 studies** Studies: Lindenmeyer[37]; Hatef[18]	1	1	Attending a clinic with access to a nonmydriatic camera increased the likelihood of the completion of annual diabetic eye exam compared to patients attending clinics with no access. *Odds ratio =1.51 (CI: 1.05-2.15); P = 0.02.* [Predictive - Author analysis (Hatef 2015[18])] - Enabler *Another difficulty was the practices needed to allocate a room for screeners and their mobile equipment. This arrangement was seen as superior to a van in the practice care part, but led to other practice staff feeling crowded out and screeners working in isolation if practice staff were not involved, for example, by preparing patients for screening.* [Author interpreted summary (Lindenmeyer 2014[37])] - Barrier
Screening perceived as too resource intensive (2 studies)	**No sub-themes** **2 studies** Studies: Lindenmeyer[37]; Hatef[18]	2	0	*However, integrating screening and routine care became problematic in one practice as the nurse felt that involvement in screening took too much of their resources* [Author interpreted summary (Lindenmeyer 2014[37])] - Barrier

Perceptions of the hospital environment (2 studies)	**Feeling (un)comfortable** **1 study** Study: Arora[6]	1	1	*Attendance to the clinics increased largely due to familiarity, comfort, more time spent with a patient*. [HCP quote (Arora 2013[6])] - Enabler
	Seriousness **1 study** Study: John[25]	0	1	*While participants agreed that it was good to have screening locally, some said that, if it were hospital appointment, people would take it more seriously*. [Author interpreted summary (John 2014[25])] - Enabler

Domain: Social Influences (35 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Doctor-Patient communication (25 studies)	**Absence or presence of a HCP recommendation to attend screening** **16 studies** Studies: Al-Malki[4]; Schoenfeld[58]; Orton[49]; Griffen-Shirley[16]; Moss[44]; Roy[56]; van Eijk[64]; Dervan[13]; John[25]; Adriono[2]; Hwang[23]; Yuen[69]; Walker[65]; Buonaccorso[9]; Lake[32]; Kizor-Akaraiwe[30]	11	9	*Among the appropriately screened participants, the main positive incentives identified were…physician recommendation of the need for regular ocular examination (17%).* [Statistical data (Dervan 2008[13])] - Enabler *The doctor said it was important to go…' was a particularly potent incentive being positively endorsed by 98% of the sample* [Statistical data (Walker 1997[65])] - Enabler *My doctor did not mention anything about the importance of being seen at the eye clinic. If he mentions it, I will attend…I am sure.* [Patient quote (Al- Maki 2009[4])]- Barrier [Barrier]…*Doctor didn't say to go (27%)* [Statistical data (Walker 1997[65])] - Barrier *No eye screening recommendation occurred more often in no-attenders than attenders. Odds ratio = 0.002 (CI: 0.0001-0.006).* [Predictive - Author analysis (van Eijk 2012[64])] - Barrier
	Language **10 studies** Studies: Massaro[42]; Applebee[5]; John[25]; Arora[6]; Griffen-Shirley[16]; Sachdeva[57]; Rajput[55]; Silver[61]; Lindenmeyer[37];Lu[40]	10	0	…*2% said that they did not attend because of language difficulties*. [Statistical data (Sachdeva 2012[57])] - Barrier *While participants agreed that language could be an issue, most said they had systems in place to overcome this problem, such as use of interpreters and family members. In contrast, screeners focused on the language barrier as an issue they face in everyday practice.* [Author interpreted summary (John 2014[25])] - Barrier

	General lack of information provision **4 studies** Studies: John[25]; Hartnett[17]; Lake[32]; Buonaccorso[9]	4	0	*GPs, nurses, opticians and ophthalmologist came in for severe criticism by some participants and screeners with regard to communication and information sharing. Most expressed disappointment at the lack of information provided on diagnosis…* [Author interpreted summary (John 2014[25])] - Barrier *…if he (GP) had told me that sometimes even before the (DR) diagnosis there could be retinopathy that would definitely have had an influence.* [Patient quote (Lake 2017[32]] - Barrier
	Unable to contact patients **1 study** Study: Hartnett[17]	1	0	*…whereas ophthalmologist listed…patients not having telephones or mechanisms for communications…* [Author interpreted summary (Hartnett 2005[17])] - Barrier
Absence or presence of support from family members (11 studies)	**Instrumental/pragmatic support** **7 studies** Studies: Massaro[42]; Strutton[62], Peng[53]; Yuan[68]; John[25]; Lindenmeyer[37]; Walker[65]	6	1	*Patients who lived within easy walking/bus distance from the practice and those driving by a spouse or relative were generally satisfied, whereas others found getting home difficult*…[Author interpreted summary (Lindenmeyer 2014[37])] - Enabler *…and it was their family member's unavailability that had prevented them from attending.* [Author interpreted summary (Strutton 2016[62])] - Barrier
	Social/emotional support **5 studies** Studies: Lake[32]; Lewis[36]; Khandekar[28]; Lee[35]; Walker[65]	3	2	*My wife (is) always encouraging me, she always reminds me. She's always asking "are you due for an eye check. Have you done your eye check?"* [Patient quote (Lake 2017[32])] - Enabler *By contrast non-attendees reported their families did not understand the necessity for repeated clinic attendances.* [Author interpreted summary (Lewis 2007[36])] - Barrier
Trust in the doctor (5 studies)	**No sub-theme** **5 studies** Studies: Arora[6]; Peek[52]; van Eijk[64]; Walker[65]; Lake[32]	4	1	*Discussion with both the program administrator and patient s reinforced the concept that community-based clinics foster feelings of trust and support amongst attendees.* [Author interpreted summary (Arora 2013[6])] - Enabler [Barrier]…*Don't trust doctors (9%).*…[Statistical data (Walker 1997[65])] – Barrier

				'…57% of persons reporting healthcare discrimination said they had an eye exam within the prior 12 months in comparison to 74% of those who did not report such discrimination (P = 0.03)'. [Numerical data (Peek 2011[52])] - Barrier
Stigma (3 studies)	**No sub-theme** **3 studies** Studies: Silver[61]; Lake[32]; John[25]	3	0	*Other barriers encountered by health professionals include…confronting social stigma relating to having the disease.* [Author interpreted summary (Silver 2006[61])] - Barrier *Participants in our women-only focus group interviews talked about being 'ashamed' about other people knowing their health problems.* [Author interpreted summary (John 2014[25])] - Barrier
Support from local community groups/networks (3 studies)	**No sub-theme** **3 studies** Studies: Livingstone[38]; Arora[6]; John[25]	0	3	*Others believed that one should not rely solely on GPs to disseminate this information and one should use all available community networks to promote the service*. [Author interpreted summary (Livingstone 1998[37])]- Enabler *Discussion with both the program administrator and patients reinforced the concept that community-based clinics foster feeling of trust and support amongst attendees*. [Author interpreted summary (Arora (2013[6])] - Enabler
Media attention (4 studies)	**Lack of media attention** **1 study** Study: Hipwell[20]	1	0	*I don't think screening is something that's pushed as much as other screening. I mean retinal screening is…I'd say it's important … but things like breast cancer, there's a lot more press about it.* [HCP quote (Hipwell 2014[20])] - Barrier
	Using media to promote attendance **2 studies** Studies: Livingstone[38]; John[25]; Fisher[14]	0	2	*Local television and radio channels were highlighted as excellent forums to raise health promotion and improve awareness.* [Author interpreted summary (John 2014[25])]- Enabler *The members recommended the use of the local media to promote the service.* [Author interpreted summary (Livingstone 1998[38])] - Enabler
Cultural/Social compatibility between patient/HCP (2 studies)	**No sub-theme** **2 studies** Studies: Al-Alawi[3]; Arora[6]	1	1	*Patients felt nurses of Aboriginal descent could better empathize about this than doctors could, and thereby provide culturally-relevant recommendations…*[Author interpreted summary (Arora 2013[6])] - Enabler

				[Perception of barriers for eyecare}. Lack of gender specific eyecare professionals (60%). [Statistical data (Al-Alawi 2016[3])]- Barrier
Comparison with others (2 studies)	**No sub-theme** **2 studies** Studies: Lake[32]; Fisher[14]	0	2	*'I was talking to a friend before my exam yesterday and she's now got it [DR] in both eyes…I have empathy for [her], but then I think 'Gee, I'm glad it's not me'…this is why I go and get my eyes tested every year'.* (ID40)*"* (Patient quote (Lake 2017[32]). – Enabler
Communication issues within or between services (2 studies)	**No sub-theme** **2 studies** Studies: Strutton[62]; Lindenmeyer[37]	2	0	*In all but the three highest performing practice, practice staff and screeners identified communication issues between practices and screening series.* [Author interpreted summary (Lindenmeyer 2014[37])] = Barrier *Some patients were reported by general practice staff to be known to be out of the area/country, some permanently. A small number of patients were known by general practice staff to have no fixed abode* [Author interpreted summary (Strutton 2016[62])] - Barrier
Having a screening team leader (2 studies)	**No sub-theme** **2 studies** Study: Lindenmeyer[37]; Fisher[14]	0	2	*…study participants also stresses the importance of an identified team leader.* [Author interpreted summary (Lindenmeyer 2014[37])] – Enabler 'The patient-suggested method to improve education about eye examinations included: having a manged care advocate or case manager coordinate, trach and inform patients about necessary tests and appointments' [Author's interpreted summary (Fisher 2016[14])] - Enabler
Obligation to attend (1 study)	**No sub-theme** **1 study** Study: van Eijk[64]	0	1	*Feeling obliged to attend screening occurred less often among non-attenders than attenders. Odds ratio = 7.7 (4.2-14.3).* [Predictive - Author analysis (van Eijk 2012[64]) - Enabler

Domain: Knowledge (35 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Awareness of illness (diabetes/DR and the link between them) **(19 studies)**	**(Lack of) Awareness of diabetic retinopathy** **12 studies** Studies: Applebee[5]; Adriono[2]; Mumba[45]; van Eijk[64]; Sheppler[59]; Lake[32], Lewis[36]; Khandekar[28]; Kovarik[31]; Nathanial[46]; Dervan[13]; Rajput[55]	7	5	*The almost 100 per cent motivating factor for people under 65 who regularly attend for DR screening was their knowledge that bleeding in their eyes can lead to blindness.* [Author interpreted summary (Applebee 2012[5])] - Enabler *If I had realised the possibility that it would suddenly go, that I wouldn't realise that it was coming on, I think I would have taken more care. It's all great in hindsight but if I knew then what I know now, then this problem wouldn't have happened.* [Patient quote (Lewis 2007[36])] – Barrier This study found that awareness of the eye complications of diabetes did not influence the decision to go for an eye examination which could lead to early detection of eye complications. [Nathaniel (2015[46]) Author interpreted summary] – Null finding In our study, an increased knowledge base of diabetic retinopathy other than recommended yearly exam did not significantly affect screening uptake [Dervan (2008[13]) Author interpreted summary] – Null finding
	(Lack of) Awareness of the link between diabetes and retinopathy **6 studies** Studies: Applebee[5]; Peng[53]; Lake[32]; John[25]; Lewis[36]; Lu(b)[40]	3	4	The belief that diabetes could affect vision was found to be significantly associated with reported receipt of DR exam. *Beta weight = -1.407; P = 0.030.* [Predictor - Author analysis (Peng 2010[49])] - Enabler Both patients and providers identified lack of awareness as the greatest barrier to attendance…Patients know diabetes could affect the eyes, but were not aware that it could lead to blindness, and that even severe disease could be asymptomatic. [Lewis (2007[36]) Author interpreted Summary] - Barrier
	(Lack of) Awareness/knoweldge of diabetes	4	0	*The most cited barrier to diabetic eye care was lack of patient education and knowledge about diabetes mellitus.* [Author interpreted summary (Hartnett 2005[17])] - Barrier

	4 studies Studies: Cano[10]; Hartnett[17]; Schoenfeld[58]; Hurrell & Donohoe[22]			Less self-reported practical knowledge of diabetes were predictive of nonadherence. *Odds Ratio = 1.57 (1.18-2.08)* [Predictors - Author analysis (Schoenfeld 2001[58])] - Barrier
(Lack of) Awareness of screening (17 studies)	**(Lack of) Awareness of importance of screening** **11 studies** Studies: Yuan[68]; Al-Malki[4]; Applebee[5]; John[25]; Mumba[45]; Lee[35]; Peng[53]; Orton[49]; Lake[32]; Lu(b)[40]; Fisher[14]	8	3	*They know it is important that they go, and so they keep the appointment…[*Author interpreted summary (Applebee 2012[5])]- Enabler *Last year my daughter told me to check my eye, I did not believe her, I said that my eye no problem, I don't think it can go to blind immediately. Now it's too late, my left eye cannot see.* [Patient quote (Yuan 2007)[68]] - Barrier *Reasons given by patients for non-attendance in last two years: I don't know it is necessary (43.2%)* [Statistical data (Peng 2010[53])]- Barrier
	(Lack of)Awareness of recommended frequency of screening **5 studies** Studies: Schoenfeld[58]; Adriono[2]; Dervan[13]; Buonaccorso[9]	3	2	*In our study…the knowledge of the requirement for a yearly-dilated eye exam are predisposing factors that positively influence the uptake of screening.* [Author interpreted summary (Dervan 2008[13])] - Enabler *The most common reasons [for not having sought eye examinations] were…did not know the eyes should be examined regularly (25 of 160 [15.6%]].* [Statistical data (Adriono 2011[2])] - Barrier
	General lack of awareness (of screening) **3 studies** Studies: Njambi[47]; Al-Malki[4]; Hipwell[20]	2	1	*Antecedents to attendance included knowledge about diabetic retinopathy and screening.* [Author interpreted summary (Hipwell 2014[20])] - Enabler *Lack of awareness among non-attending patient was confirmed in this study; 22% explained that they do not know anything about DR screening* [Author interpreted summary (Al-Malki 2009[4])] - Barrier
Confusion between screening and routine eye tests (8 studies)	**No sub-themes** **8 studies**	8	0	*The most common reason why patients did not have a dilated examination by an ophthalmologist during the previous year was…being unaware of the difference between an ophthalmologist and an optometrist (20.8%).* [Statistical data (Roy 2004[56])] - Barrier

	Studies: Sachdeva[57]; Peng[53]; Roy[56]; Hipwell[20]; Hurrell & Donohoe[22]; Applebee[5]; Strutton[62]; John[25]			*A number of patients and a few general practice staff provided reasons for their/their patients' non-attendance that demonstrated them being misinformed. These included: not understanding that diabetic retinopathy screening is not performed as part of a standard optician eye test.*…[Author interpreted summary (Strutton 2016[62])]- Barrier
Education and training (9 studies)	**(Lack of)Education on importance of screening** **4 Studies** Studies: Fisher[14]; Will[67]; Byun[8]; Buonaccorso[9]	2	3	The more recently patients participated in a blindness prevention program, the more likely they were to have annual examinations *(P = 0.002).* [Predictions - Author analysis (Will 1994[67])]- Enabler *Lack of targeted patient education about the importance of dilated eye examination was cited as a common barrier to compliance with exams by both patients (12/290 and providers (13/18).* [Statistical data (Fisher 2015[14]]-Barrier
	General self-management education/training **2 studies** Studies: Gala[15]; Paksin-Hall[50]; Zhang[70]	0	2	Receiving diabetes self-management education significantly increased the likelihood of obtaining annual dilated examinations. *Odds Ratio = 1.56, (CI: 1.27-1.92); P<0.001).* [Predictions - Author analysis (Paksin-Hall 2013[50])]-Enabler Participants in diabetes management classes had increased odds of undergoing a dilated eye examination within the past year. Adjusted *Odds Ratio = 1.40 (CI: 1.24-1.57).* [Predictions - Author analysis (Gala 2013[15])]-Enabler
	Education sessions with diabetes specialists **2 studies** Study: Fisher[14]; Yuen[69]	0	2	The patient-suggested methods to improve education about eye examinations included: programs and sessions with diabetes specialists that are free to the patient oar are covered by insurance…[Author's interpreted summary (Fisher 2016[14])] – Enabler Multivariable analyses indiated three variables were significantly associated with having an eye examination in the last 12 months…see a nurse/diabetes educator for diabetes in the past 12 [Predictions – Authors Analysis (Yuen 2012[69])] - Enabler

	Biofeedback as educational resource **1 study** Study: Lewis[36]	0	1	*Patients believed that the images produced by retinopathy screening could be a valuable educational device. Although some patients could not understand the images presented, others were able to see the progression of their condition, and found this helpful in motivating them to come to the clinic* [Author interpreted summary (Lewis 2007[36])]- Enabler
	Use of a celebrity as an educational spokesperson **1 study** Study: Fisher[14]	0	1	Physicians also suggested methods to educate patients, including: television commercials featuring a celebrity spokes-person who has experience with retinopathy [Author's interpreted summary (Fisher 2016[14])] - Enabler
	Provision of motivational materials **1 study** Study: Fisher[14]	0	1	The patient-suggested methods to improve education about eye examinations included:.. motivational information on reminder postcards (although acceptable in New York, many patients in Los Angeles viewed these as an invasion of privacy). [Author's interpreted summary (Fisher 2016[14]) - Enabler
Misunderstanding of treatment options for DR **(2 studies)**	**No sub-themes** **2 studies** Studies: Schoenfeld[58]; John[25]	2	0	*...nonadherent participants were more likely than adherent participants to believe that no treatment for diabetic retinopathy is currently available (48% vs. 35%; P<.0.001.* [Prediction – Author analysis (Schoenfeld 2001[58])] - Barrier *…a patient who came to the hospital and had an occlusion in their eye…had gone completely blind, but left it a week, as they had a screening appointment and thought we will be able to do something about it.* [Screener quote (John 2014[25])] - Barrier
(Lack of) knowledge of insurance benefits (1 study)	**No sub-themes** **(1 study)** Study: Fisher[14]	1	0	A lack of understanding of insurance benefits was the barrier that was mentioned most frequently [Numerical data (Fisher 2016[14]) - Barrier

Domain: Memory, Attention and Decision Processes (N = 34)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Symptoms (24 studies)	**Absence of symptoms** **24 studies** Studies: Griffen-Shirley[16]; Moss[44]; Massaro[42]; Njambi[47]; Rajput[55]; John[25]; Kovarik[31]; Al-Malki[4]; Onakpoya[48]; Roy[56]; Peng[53]; Adriono[2]; Lee[35]; Will[67]; Hipwell[20]; Hurrell & Donohoe[22]; Lindenmeyer[37]; Applebee[5]; Yuan[68]; Laver[33]; Walker[65]; Lake[32]; Kizor-Akaraiwe[30]; Fisher[14]	24	0	*The most common reasons [for not having sought eye examinations' were 'felt vision was good, no need to examine the eyes' (72 of 160 [45%]).* [Statistical data (Adriono 2011[2])] - Barrier *…absence of eye symptoms [50.8%]…was a main barrier to having previous dilated eye examination.* [Statistical data (Onakpoya 2010[48])] - Barrier *…you don't recognise that the vision is going until it Is too late* [Patient quote (Hipwell 2014[20])] - Barrier
	Presence of symptoms **2 studies** Studies: Hurrell & Donohoe[22]; Yuan[68]	0	2	*I am keen to attend as I have noticed diabetes affecting my eye sight.* [Patient quote (Hurrell & Donohoe 2012[22])] - Enabler *I came here because my feel vision loss* [Patient quote (Yuan 2007[68])] - Enabler
	Symptoms attributed to old age **1 study** Study: Yuan[68]	1	0	*When I feel my vision loss I think may be because I am old, so I did not pay attention to it, only bought a pair of glasses* [Patient quote (Yuan 2007[68])] - Enabler
Competing health problems (13 studies)	**Burden of disease and its treatment (e.g. multiple appointments)** **6 studies**	6	0	*Lower priority compared to all the other things a DM patient has to deal with (12/18).* [Statistical data (Rajput 2015[55])] - Barrier

	Studies: Lindenmeyer[37]; Hartnett[17]; Rajput[55]; Kovarik[31]; John[25]; Lake[32]			*Patients stated that the burden of diabetes and its treatment, especially insulin use, overshadowed concern about eye disease and the need to have yearly eye examinations.* [Author interpreted summary (Hartnett 2005[17])] - Barrier
	Comorbidities **5 studies** Studies: Puent[54]; Lee[35]; Orton[49]; Peng[53]; Lake[32]	5	0	*Reported reasons for noncompliance by participants with diabetic retinopathy included: other medical condition(s) that took precedence over an eye examination.* [Statistical data (Lee 2000[35])] - Barrier *Reasons given by patients for non-attendance in last two years;…I have other health problems to take care of (5.2%).* [Statistical data (Peng 2010[53])] - Barrier
	Feeling unwell **3 studies** Studies: Hipwell[20]; Strutton[62]; Sachdeva[57]	3	0	*Reasons for non-attendance included:…24 (12%) were unwell at the time of the screening.* [Statistical data (Sachdeva 2012[57])]- Barrier *I [screening staff] called patient and his mother said that he is very ill at the moment…She said that he vomits a lot so it is difficult to get to appointments.* [HCP quote (Strutton 2016[62])] - Barrier
Forgetting (10 studies)	**Forgetting to attend a screening appointment** **6 studies** Studies: Puent[54]; Strutton[62]; Njambi[47]; Hartnett[17]; Applebee[5]; Mackenzie[41]	6	0	*The main barriers were: …Memory (forgot appointment) (8%*). [Statistical data (Mackenzie 2015[41])] - Barrier *Often people lose track about the various tests they have had – or even whether they have had them*. [Service provider quote (Applebee 2012[5])] - Barrier
	HCPs prompts and cues for patients **4 studies** Studies: Applebee[5]; Livingstone[38]; Lindenmeyer[37]; Fisher[14]	0	4	*Those who regularly attended a local eye service believed this was because they received a reminder letter…or telephone call.* [Author interpreted summary (Livingstone 1998[38])]- Enabler *Practice staff often described phoning patients, either in advance to remind them of their screening appointment or after they did not attend; they would then attempt to slot them in later the same week or at a central catch-up clinic.* [Author interpreted summary (Lindenmeyer 2014[37])] - Enabler

	Forgetting to make a screening appointment **1 study** Study: Orton[49]	1	0	*Rather than making a deliberate decision not to be screened, patients said that they often simply forgot to make their screening appointment*…[Author interpreted summary (Orton 2013[49])] - Barrier
Have been checked elsewhere (5 studes)	**No sub-theme** **5 studies** Studies: Puent[54]; Hipwell[20]; Moss[44]; Walker[65]; Kizor-Akaraiwe[30]	5	0	*Transferring of eye care, either to a retinal specialist (18.6%) or another optometrist (11.6%).*[Statistical data (Puent 2004[54])] - Barrier *Reasons for not having examination by Ophthalmologist or Optometrist in previous year: …13% (younger onset) and 9% (older onset) said they had their eyes examined by family physician* [Statistical data (Moss 1995[44])] - Barrier
Knowing it's a routine test (3 studies)	**No sub-theme** **(3 studies)** Study: Dervan[13]; Mackenzie[41]; Walker[65]	0	3	[Enabler] 'It's a routine test…' (87%) [Statistical data [Walker 1997[65])]- Enbler [Main expressed motivating factor factors were: …just part of routine diabetes care [Statistical data (Mackenzie 2015[41])] - Enabler
Lack of attention given to screening (2 studies)	**No sub-theme** **2 studies** Studies: Chou[12]; CDCP[11]	2	0	*Reasons given by women diagnosed with diabetic retinopathy for not receiving recommended follow-up eye examination: …. have not thought of it (5%).* [Statistical data (CDCP 2010[11])] - Barrier

Domain: Beliefs about consequences (26 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Perceived necessity of screening (13 studies)	**General perception that screening is not necessary** **6 studies** Studies: Peng[53]; Roy[56]; Schoenfeld[58]; Chou[12]; Hipwell[20]; Walker[65]	6	0	*Reasons given by patients for non-attendance in last two years:…I feel it is unnecessary (23.9%).* [Statistical data (Peng 2010[453])] - Barrier *Of those who reported not seeking eye care in the preceding 12 months, 39.7% reported 'no need'* [Statistical data (Chou 2014[12])] - Barrier
	Perception screening not necessary if diabetes is under control **3 studies** Studies: Yuan[68]; Rajput[55]; Al-Malki[4]	3	0	*…I think if I can control my blood sugar well, I don't need to see eye doctor every year, but now I know it is wrong…* [Patient quote (Yuan 2007[68])] - Barrier *…we can see that 48.2% of both genders and 48.1% of both nationalities (Arab/non-Arab) say that their blood sugar is under control and there is no need to attend DR screening.* [Statistical data (Al-Malki 2009[4])] - Barrier
	Perception screening not necessary if previous results were clear **3 studies** Studies: Applebee[5]; Orton[49]; Walker[65]	3	0	*Interviewees felt that people would be less inclined to go for screening again if previous screening results had repeatedly been clear …as they would assume everything was fine.* [Author interpreted summary (Orton 2013[49])] - Barrier *[Barrier] Already had test before; doctor said eyes fine (27%)* [Statistical data (Walker 1998[65])] - Barrier
	Perception screening only necessary for older patient **2 studies**	2	0	The belief that screening is not useful at their age (under 70) was more likely among non-attenders than attenders. *Odds ratio = 0.11 (CI 0.04-0.29).* [Prediction - Author analysis (van Eijk 2012[64])] – Barrier Although broader knowledge deficits, such as lack of knowledge of DR symptoms and risk factors, did not seem to impede screening uptake for older adults they

	Study: van Eijk[64] ; Lake [32]			appeared to perpetuate health misconceptions for young adult participants, including the view that DR was only a concern for older people [Author's interpretive summary (Lake 2017[32]) - Barrier
Short-term effects of screening (11 studies)	**Discomfort** **11 studies** Studies: Strutton[62]; Pasagian-Macaulay[51]; Moss[44]; Mackenzie[41]; Yuan[68]; Peng[53]; Dervan[13]; Massaro[42]; Hipwell[20]; Walker[65]; Lake [32]	11	0	*We also found that the requirement for mydriasis may be a negatively influencing enabling factor* [Author interpreted summary (Dervan 2008[13])] - Barrier *I don't want doctor to enlarge my pupil because I think it will hurt my eye, so I did not to see eye doctor* [Patient quote, (Yuan 2007[68])] - Barrier
	Inconvenience **4 studies** Studies: Hipwell[20]; Dervan[13]; Walker[65]; Lake[32]	4	0	*Among the unscreened participants the barriers mentioned were the prohibition of driving after mydriasis (17%).*…[Statistical data (Dervan 2008[13])] - Barrier *However, alternative travel arrangements also emerged as impractical because blurred vision caused an inability to navigate efficiently.* [Author interpreted summary (Hipwell 2014[20])] - Barrier
Screening provides valuable info on the health status of your eyes/vision **(7 studies)**	**Early detection** **5 studies** Studies: Pasagian-Macaulay[51]; Hipwell[20]; Lake[32]; Mackenzie[41]; Walker[65]	0	5	*Early detection of eye problems was the most frequently agreed upon benefit (96% responded with definitely or probably.* [Author interpreted summary (Pasagian-Macaulay 1997[51])] - Enabler *I always think 'if I don't go, I won't know'; but then I want to know because it could be worse next.* [Patient quote (Lake 2017[32])] - Enabler
	Reassurance **5 Studies** Studies: Hipwell[20]; Hurrell & Donohoe[22]; Laver[33]; Walker[65;] Lake[32]	0	5	*Participants' desire to obtain reassurance that their eyes were healthy was the only identified incentive to attend* [Author interpreted summary (Laver 2013[33])] - Enabler *I like the fact that you instantly see and can get a decent steer on if there is anything negative; it's complete peace of mind – well my results anyway* [Patient quote (Hipwell 2014[20])] - Enabler

Salience of the consequences (4 studies)	**No sub-theme** **4 studies** Studies: Hipwell[20], Mackenzie[41]; Lewis[36]; Walker[65]	0	4	*So what is it that encourages you to come [to the screening] then?...My brother-in-law he was a very bad diabetic…He actually died from it. He went blind first.* [Patient quote (Hipwell 2014[20])] - Enabler *The main expressed motivating factors were: …family history of diabetes (8 %`).* [Statistical data (Mackenzie 2015[41])] - Enabler
Concerns about harmful effects of screening procedure (4 studies)	**No sub-themes** **4 studies** Studies: Sachdeva[57]; Hipwell[20]; Hossen[21]; Walker[65]	4	0	*The main reason for refusal [to screen] was that retinal photos taken might worsen sight.…*[Patient perspective (Hossen 2015[21])] - Barrier *Reasons for non-attendance included: ...had registered concerns about the procedure (4%).* [Statistical data (Sachdeva 2012[57])] - Barrier
Lack of understanding of benefits of screening (1 study)	**No sub-theme** **1 study** Study: Rajput[55]	1	0	*Lack of understanding of the benefits (8/18).* [Statistical data (Rajput 2015[55])] - Barrier
Anticipated outcome (1 study)	**Anticipated regret** **1 study** Study: Lake[32]	0	1	"[If I don't have screening] I'll *be under metal torture. I'll be thinking about it, 'Oh my gosh, is something wrong with my eyes'? So, I'd rather go and get it done then, go ahead, even with the discomfort [otherwise] the rest of the days I'd be thinking something is wrong with my eyes."* [Patient quote (Lake 2017[32]) - Enabler
	Expectation of a positive outcome **1 study** Study: Lake[32]	0	1	*"I have confidence when I go there, my sugar is under control, so I generally expect good results (ID33)* [Patient quote (Lake 2017[32]) - Enabler
General doubt about the ability of conventional health care to change helath status (1 study)	No sub-theme 1 study Study: Bell[7]	0	0	No association found between medical skeptisim and dilated eye exams. [Statistical data (Bell 2011[7])] – Non-finding

Cultural beliefs or myths (1 study)	**No sub-theme** **1 study** Study: Lu(b)[40]	**1**	0	Fewer patients reported that they experienced barriers such as…cultural beliefs or myths (4%) [Numerical data (Lu (2016b[40])] - Barrier

Domain: Emotion (23 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Fear/anxiety (20 studies)	**Fear/anxiety of vision loss** **14 studies** Studies: Mackenzie[41]; Applebee[5]; Dervan[13]; Hartnett[17]; Peng[53]; van Eijk[64]; Rajput[55] Njambi[47]; Pasagian-Macaulay[51]; Lewis[36]; Cano[10]; Walker[65]; Lake[32]; Lu(b)[40]	7	7	*When asked why they attend regularly people gave answers such as "(I) don't want to go blind"…"I am worried about going blind."* [Patient quote (Applebee 2012[5])] Enabler Worrying about eyes was found to be significantly associated with reported receipt of DR exam. *P = 0.017.* [Predictors - Author analysis (Peng 2010[53])] - Enabler *[Barrier] …afraid doctor will find something wrong (11%)* [Statistical data (Walker 1997[65])] - Barrier *Although fear of losing vision acted as an incentive to attend the eye clinic. Fear of being given a diagnosis of impending blindness was a power disincentive.* [Author interpreted summary (Lewis 2007[36])] - Barrier
	Fear/anxiety of DRS procedure **6 studies** Studies: Lake[32]; Lu[39]; Strutton[62]; Hipwell[20]; Lewis[36]; Walker[65]	6	0	*The most common anxiety expressed was that of patients disliking the eye drops used during screening.* [Author interpreted summary (Strutton 2016[62])] - Barrier *Dilation leads to operations* [Patient quote (Walker 1997[65])] - Barrier
	Fear/anxiety of treatment implications **3 studies** Studies: Al-Alawi[3]; Khandekar[28]; Lake[32]	3	0	*Defaulting patients stated that the main barriers to presenting for an appointment were:…fear of laser treatment.…*[Author interpreted summary (Khandekar 2011[28])] - Barrier *I was scared of what damage was done, I was scare of what would have to be done or if anything could be done, if there was damage. I was scared of losing me (driving) license, I mean that would really leave me in a pickle. Just scared I suppose of confronting the fact that my eyesight could be permanently*

				damaged…being confronted with what's there. [Patient quote (Lake 2017[32])] - Barrier
	Absence of fear or worry about vision loss **study** Study: Schoenfeld[58]	1	0	*…nonadherent participants expressed less concern about losing their vision from diabetes than adherent participants (46% vs. 40% seldom or never worried about it; P<0.001.* [Statistical data (Schoenfeld 2001[58])] - Barrier
Defensive responses (5 studies)	**No sub-theme** **5 studies** Studies: Rajput[55]; Laver[33]; Al-Malki[4]; Strutton[62]; Lake[32]	4	0	*Nothing will force me to attend…I cannot suggest anything.* [Patient quote (Al-Malki 2009[4])] - Barrier *The young adults who participated wanted to attend screening but actively engaged in strategies that prevented them from prioritising it.* [Author interpreted summary (Laver 2013[33])] - Barrier
Emotional burden of diabetes in general (3 studies)	**No sub-theme** **3 studies** Studies: Applebee[5]; Hartnett[17]; Lewis[36]	3	0	*I couldn't help getting my diabetes, but going to eye clinics is about my having failed with my looking after my diabetes. So it has a very different feel to it. Every time I go, it re-enforces my sense of failure about not looking after my diabetes properly.*[Patient quote (Lewis 2007[36])] - Barrier
The need for HCPs to express compassion (2 studies)	**No sub-theme** **2 studies** Studies: Hartnett[17]; Arora[6]	0	2	*Both groups cited the importance of physician compassion to patients.* [Author interpreted summary (Hartnett 2005[17])] - Enbler *When the nurses speak with the patients, they would commonly ask "How do you feel emotions? How do you feel spiritually?" This is a method of communication about health that the Aboriginal people better understand.* [Author interpreted summary (Arora 2013[6])].
Depression (2 studies)	**No sub-theme** **2 studies** Study: Lu(a)[39]; Lu(b)[40]	1	0	*…more Hispanic patients [compared to African Americans] felt that being "upset" or "depressed" was a barrier (32 vs. 11% P= 0.03).*[Statistical data (Lu 2016[39])] - Enabler

Positive Emotions (1 study)	**Screening is enjoyable** **1 study** Study: Lake[32]	0	1	*It was actually quite fun. I don't know why I put it off. I was really scared going in but definitely not now. I'm not fazed by it at all. The thought that I can control this is quite reassuring*. [Patient quote (Lake 2017[32])] - Enabler
	Feeling relieved **1 study** Study: Lake[32]	0	1	*Many described positive emotions such as "relief when [the optometrist' says that everything is fine" (ID 14_OA), leaving the examination "feeling in a good mood" (ID40_YA with "absolute evidence that things are great" (ID15_OA)* [Author's interpreted summary (Lake 2017[32]) - Enabler

Domain: Goals (13 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Goal priority (12 studies)	**Protecting vision, a priority** **9 studies** Studies: Schoenfeld[58]; Sheppler[59]; Kovarik[31]; Njambi[47]; Roy[56]; Hipwell[20]; Mackenzie[41]; Walker[65]; Lake[32]	5	4	*I want my vision so I can see my grandchildren* [Patient quote (Walker 1997[65])] – Enabler *"I drive, going to work, coming back home and on the weekend I'm driving family around…I need my eyes to do all these things"(ID34)* [Patient quote (Lake 2017[32]) – Enabler *Barriers to diabetic retinopathy screening examinations as reported by those patients who did not have dilated fundus examinations in the previous year: Not a priority (19%).* [Statistical data (Kovarik 2016[31])] - Barrier
	Attending DRS relative to other diabetes/comorbidies self-management requirements **3 studies** Studies: Applebee[5]; John[25]; Fisher[14]	3	0	*Multiple appointments and comorbidities were frequently cited as barriers to screening, with patients required to visit the hospital or FP practice on several occasions, sometimes related to the same problem. One participant expressed concern when she had to visit the hospital four times in one week* [Author interpreted summary (John 2014[25])] = Barrier *Having diabetes is very hard work and the patient has to have a lot of incentives to actively comply with everything that is expected of them.* [Service provider quote (Applebee 2012[5])] - Barrier
	Goal priority of HCP relative to competing professional demands **1 study** Study: Lindenmeyer[37]	1	0	*Screening takes up virtually an entire week of my clinical time, which is difficult because I do have other things to be doing than reading people's eye charts*…[HCP quote (Lindenmeyer 2014[37])] - Barrier

To feel in control of health (1 study)	No sub-theme 1 study (N = 0 from UK) Study: Walker[65]	0	1	[Enabler]…*For a feeling of control over your health (82%)* [Statistical data (Walker 1997[65])] - Enabler

Domain: Social professional role and identity (11 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Illness identity (6 studies)	**Not identifying as having diabetes or feeling uncomfortable with identifying as a person with diabetes** **5 studies** Studies: Lake[32]; Strutton[62]; Puent[54]; Cano[10]; Hipwell[20].	5	0	*In response to being asked why people might not attend DRS, professionals and patients both acknowledged that denial of having diabetes could contribute* [Author interpreted summary (Hipwell 2014[20])] - Barrier *Not yet accepted the diagnosis of diabetes and its associated indications for periodic care (denial) (7%).* [Statistical data (Puent 2004[54])] - Barrier *I've been to a Living Well with Diabetes event…the one thing I found is that probably 95% of the room comprised of 60+ year olds. So there was only a handful, literally 10 people out of 300 that were my age group. Being in that kind of environment felt a bit strange to me.*[Patient quote (Lake 2017[32])] - Barrier
	Dislike having diabetes **1 study** Study: Lewis[36]	1	0	*I can't help it. I don't like being diabetic…I am as normal as anybody else, I can do what anybody else can do* [Patient quote (Lewis 2007[36])] - Barrier
HCPs role in diabetic retinopathy screening (N3 studies)	**HCPs responsibility to make an appointment for patient** **3 studies** Study: Hipwell[20]; Buonaccorso[9]; Peng[53]	0	3	*They believe* [Practitioners] *that once the patient sees an eye-care practitioner annual follow-up would best be scheduled by that eye-care practitioner* [Author interpreted summary (Buonaccorso 1999[9])] - Enabler *I used to need doctor to make an appointment for me (1.3%).* [Statistical data (Peng 2010[53])] - Enabler
	Professionals' responsibility to explain the implications of diagnoses to their patients	1	0	*As soon as I had diabetes diagnosed somebody should have explained to me more fully what the implications are. Because it's alright them giving you a leaflet and sending you home…but even though you read it, there's this kind of*

	1 study Study: Hipwell[20]			*silly thing, 'oh it won't happen to me'*. [Author interpreted summary (Hipwell 2014[20])] - Barrier
	HCPs' responsibility to tell the patient to attend screening **1 study** Study: Buonaccorso[9]	1	0	*The eye-care practitioners acknowledge that in many instances they do not tell patients to return for a follow-up visit unless there is a problem* [Author interpretated summary (Buonaccorso 1999[9])] - Barrier
Compatibility with social/cultural identity (2 studies)	**No sub-themes** **2 studies** Studies: Arora[6]; Silver[61]	2	0	*Interviews with a cultural liaison revealed that hospitals were also avoided due to the belief that 'when in the hospital, one is disconnected from Mother Earth'. A common belief in some Aboriginal communities is that in order to feed the spirit, one must stay connected to nature* [Author interpreted summary (Arora 2013[6])] - Barrier *Specific to the patient and healthcare professional relationship, the research revealed that diabetes health professionals are frustrated both with American Indian and Alaska Natives long phases of denial and with their own inability to encourage self-empowerment among their patients* [Author interpreted summary (Silver 2006[61])] - Barrier

Domain: Intention (9 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
No intention to go **(7 studies)**	**Don't want to go/Not a priority** **7 studies** Studies: Rajput[55]; van Eijk[64]; Massaro[42]; Mackenzie[41]; Pasagian-Macaulay[51]; Walker[65]; Kizor-Akaraiwe[30]	7	0	*Barriers to getting an annual eye examination:…Not interested in seeing an eye specialist (10%).* [Statistical data (Massaro 2010[42])] - Barrier *One endocrinologist I went to just said 'do this, do that' and I did not want to. I did not understand why I needed to.* [Patient quote (Rajput 2015[55])] - Barrier Having no interest in attending was more frequent in non-attenders than attenders. *Odds Ratio 0.5 (CI: 0.4-0.7).* [Predictors - Author analysis (van Eijk 2012[64])] - Barrier *[Barrier] …don't feel like going (21%)* [Statistical data (Walker 1997[65])] - Barrier
Intention to go (3 studies)	**I always go/nothing would stop me** **3 studies** Study: Hurrell & Donohoe[22]; Walker[65]; Lake[32]	0	2	*I would go no mater what, except if insurance doesn't cover it, but the Lord would provide a way* [Patient quote (Walker 1997[65])] - Enabler [I]…*make sure I attend all appointments – eyes, feet.*…[Patient quote (Hurrell & Donohoe 2012[22])] - Enabler
	I need to go… **1 study** Study: Lake[32]	0	1	*The majority of young adults and older adults indicated high screening intention, including young adults who had not screened: "I need to get my eyes check soon, just to know" (ID38_YA). Older adults rarely had their good intentions thwarted by barriers, with one stating "it couldn't be any easier" (ID20_OA). In contrast, young adult's intention statement were often followed by a list of barriers.* [Author interpreted summary (Lake 2017[32]) – Enabler

Domain: Beliefs about Capabilities (9 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Physical capability to attend (9 studies)	**Physical disability** **5 studies** Studies: van Eijk[64]; Kovarik[31]; Adriono[2]; Strutton[62]; Puent[54]	5	0	Limited personal mobility due to poor overall health (14%) [Statistical data (Puent 2004[54])] - Barrier Having a physical disability was more likely in non-attenders than attenders. *Odds Ratio = 0.7 (CI: 0.6-1.0).* [Predictive - Author analysis (van Eijk 2012[64])] - Barrier
	Availability of assistance Studies: Al-Alawi[3]; Al-Malki[4]; Jingi[24]; van Eijk[64]; Lee[34]	5	0	*It's too difficult to find someone to take me to that eye clinic…*[Patient quote (Al-Malki 2009[4])] - Barrier *Requiring an accompanying person was more likely in non-attenders than attenders. Odds Ratio = 0.6 (CI: 0.5-1.0).* [Predictive - Author analysis (van Eijk 2012[64])] - Barrier

Domain: Behavioural Regulation (7 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
(Lack of) Engagement with self-management (4 studies)	**No sub-theme** **4 studies** Studies: Lindenmeyer[37]; Strutton[62]; Heisler[19]; Lake[32]	3	1	For every 10-point rating of diabetes patients' reported self-management with HbA1C the odds of receiving an eye examination increase by 16%. [Prediction - Author analysis (Heisler 2003[19])] - Enabler *Some relatives of patients and general practice staff reported that patients had disengaged with their diabetes care in general.* [Author interpreted summary (Strutton 2016[62])] - Barrier
Patient setting own prompts and cues (2 studies)	**No sub-theme** **2 studies** Studies: Applebee[5]; Livingstone[38]	0	2	*People are ingenious in the strategies they develop for remembering – they said they keep appointment in ' a special draw', 'pinned to a notice board' 'written on a calendar', 'slotted into a mirror', ' as a note on my mobile phone'. Some do have, and use, a diary.* [Author interpreted summary (Applebee 2012[5])] - Enabler *They believed a diabetes kit provided to patients once diagnosed with diabetes that addressed the issues of complications of diabetes, would be advantageous. The GPs agreed that a diabetes kit with a list of recommendations and a checklist for patients visiting their specialist for diabetes-related condition would be valuable.* [Author interpreted summary (Livingstone 1998[38])] - Enabler
Patients being pro-active with appointment setting (1 study)	**No sub-theme** **1 study** Study: Hipwell[20]	0	1	*But it does rely on the patient being proactive. YOU get an appointment, alphabetical order, totally inconvenient, impractical time, what do you do. Do you do nothing and forget it or do you ring up and change it? And if you don't ring up and change it then nothing happens, you're just a DNA statistic aren't you really* [HCP quote (HIpwell 2014[20])] - Enabler

Domain: Optimism (5 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Confident that they aren't at risk (5 studies)	**No sub-theme** **5 studies** Studies: Rajput[55]; Walker[65]Al-Alawi[3];Lake[32]; Lu(b)[40]	5	0	*Some people thing that if they don't go, it won't happen. Head in the sand.* [HCP quote (Rajput 20155[5])] - Barrier *Complacency for eyecare (37%).* [Statistical data (Al-Alawi 2016[3])] - Barrier *Rather than acting to reduce their DR risk, some young adults' response to the potential threat of vision loss was "just total denial"* (ID32_YA) [Author's interpreted summary (Lake 2017[32])] - Barrier
Confident all will be well (1 study)	**No sub-themes** **1 study** Study: Lake[32]	0	1	*Although most participants understood that screening was undertaken for the early detection of DR, younger adults and older adults expressed optimism that there 'shouldn't be any problems with [my] eyesight* [Authors interpreted summary (Lake 2017[32]) – Enabler
Religious Faith (1 study)	**No sub-themes** **1 study** Study: Walker[65]	0	1	*My grandmother died after an eye operation, but I'll do whatever it takes to care for my health. You have to believe God is helping and thank God for everything.* [Patient quote (Walker 1997[65])] - Enabler

Domain: Reinforcement (3 studies)

Global Theme	Sub-theme	Barrier	Enabler	Sample Quotes
Extrinsic reward (2 studies)	**Financial Incentives** **1 study** Studies: Hatef[18]	1	1	When an incentive was offered to primary care physicians to complete annual diabetic eye exam for their eligible patients, this increased the likelihood of completion. *Odds Ratio = 1.82 (CI: 1.55-2.14); P<0.001.* [Prediction - Author analysis (Hatef 2015[18])] - Enabler When an incentive was offered to patients to complete annual diabetic eye exams, this lowered the likelihood of completing. *Odds Ratio = 0.27 (CI 0.91-0.37); P<0.001.* [Prediction - Author analysis (Hatef 2015[18])] - Barrier
	Social Incentives **1 study** Studies: Lake[32]	0	1	*"I think if I can keep my doctor and endocrinologist happy its good" (ID39)* [Patient quote (Lake 2017[32])] - Enabler
Intrinsic reward (2 studies)	**To know you are successful at managing your diabetes** **2 studies** Studies: Walker[65]; Lake[32]	0	2	[Enabler]…*For a feeling of control over your health (82%)* [Numerical data (Walker 1997[65])] – Enabler Participants cited rewards associated with screening (i.e. positive reinforcement) when receiving an all-clear screening result as an important facilitator. A positive screening outcome was often subsequently interpreted by the participant as an indicator that they were "*managing my diabetes well"* (ID12_OA) [Authors interpreted summary (Lake 2017[32])] – Enabler
	To preserve independence **1 study** Studies: Lake[32]	0	1	Having an eye examination in order to avoid negative outcomes, where 'the eyes might deteriorate without being detected' was also a strong, shared facilitator. This was particularly true of older adults who commonly stated that they engaged in screening to preserve either independence, including their " driving licence, which is very precious' (IDO7_OA). [Authors interpreted summary (Lake 2017[32])] – Enabler

Appendix S7. Expressed importance.

Reference, date, identification	Country/ Setting	Relevant topic(s) or factor(s) of investigation	Quotations indicating Expressed importance	TDF domain
Adriono (2011)[2] (Published)	Indonesia	(1) Knowledge, attitudes, beliefs, awareness, concerns & practice regarding DR (2) Prompted reasons for non-attendance	"*The most common reasons given by subjects for not having had eye examinations concerned lack of knowledge about the need for care (97 of 160 subjects [60.6%])*".	Knowledge
Al-Alawi (2016)[3] (Published)	Saudi Arabia	Perceptions of barriers to DRS	*"Travel distance to an eyecare unit, no referral from family physicians for annual eye checkups and the lack of availability of gender-specific eyecare professionals were the main perceived barriers."*	EC&R Social influences
Al-Malki (2009)[4] (Unpublished - MSc dissertation)	Qatar	Reported barriers/enablers to compliance with DRS	*"…It also established that lack of awareness about DR and problems accessing the service were important factors that limited the ability of patients to attend."*	Knowledge EC&R
Applebee (2012)[5] (Unpublished report)	UK	Identified motivations and barriers to screening and ideas for improving DRS	"*Interviews revealed that there is a genuine confusion in some people's minds about the difference between the annual eye examination and the screening test. This appears to reveal a lack of understanding about diabetes, its possible multiple effects on their eyes and the range of tests that need to be undertaken to maintain eye health"*	Knowledge
Arora (2013)[6] (Published)	Canada	Economic, geographic, societal & cultural barriers	"*The importance of cultural rituals and ceremonies within the home community was a recurring theme of the interviews. The nurse administrators explained that "appointments were almost unanimously missed if conflicting with the time of a pow-wow or other major or other major cultural activity". cultural activity".*	EC&R Social influences
Bell (2011)[7] (Published)	USA	The association between medical scepticism & measures of diabetes management behaviour (e.g. attendance at dilated eye exams)	N/a	N/a

Byun (2013)[8] (Published)	Korea	The association between diabetic care education & diabetic retinopathy screening	N/a	N/a
Buonaccorso (1999)[9] (Published)	USA	Reported barrier	*"A multidisciplinary team examined the process and discovered both member (patient) and provider (physical) barriers to annual screening. Members did not understand the clinical importance and were uncertain as to how frequently diabetic eye examinations were covered by insurance. Providers identified a role for BCBSRA to reinforce patient education on eye examinations and to assist with tracking of services."*	Knowledge EC&R
Cano (2007)[10] (Published Abstract only)	Paraguay	Reported barriers/enablers to compliance with DRS	*"The most important issues raised by the qualitative study included a general lack of awareness about diabetes and its possible complications, denial of the disease, and fear of going blind once DR had become established."*	Knowledge MADP Emotions
Centers for Disease Control and Prevention (2010)[11] (Published)	USA	Reported reasons for not receiving recommended follow-up care for DR	Taken from a table: Top barrier was reported as: Cost/insurance (43%) (women only)	EC&R
Chou (2014)[12] (Published)	USA	Reported main reasons for non-attendance	*"The most commonly reported reasons for not receiving eye care in the preceding 12 months were 'no need' and 'cost or lack of insurance'" (39.7 and 32.3% respectively)."*	MADP EC&R
Dervan (2008)[13] (Published)	Ireland	(1) Knowledge of & attitudes to DR (2) Physician recommendation	*"The most significant predictor for receiving screening was a previous physician recommendation about the necessity of a regular eye examination. The main barriers to receiving adequate screening were lack of knowledge regarding the need for ocular examination and the effect of mydriasis in prohibiting driving."*	Social influences Knowledge Beliefs about consequences
Fisher (2016)[14] (Published**)**	USA	Reported common barriers to compliance to eye exams	*'The common barriers to routine eye examination cited by 29 patients across 4 focus groups included a lack of understanding of insurance benefits (N=15), a lack of awareness of the importance of dilated eye examinations (N=12), and time constraints (N = 12).*	Knowledge EC&R MADP

			The common barriers cited by 18 providers included the patient's level lf education (N=13), eye examinations as a lower priority than the management of other diabetes-related health issues (N=12), and a lack of symptoms (N=11)'.	
Gala (2013)[15] (Published - Abstract only)	USA	Association between DSME and obtaining annual dilated eye examinations	N/A	N/A
Griffen-Shirley (2004)[16] (Published)	USA	Reported barriers to obtaining dilated fundus examinations	*"Lack of money was the most common reason cited, although more than half of the participants felt that they had no eye problems."*	EC&R MADP
Hartnett (2005)[17] (Published)	USA	(1) Barriers/incentives (2) Understanding of diabetic eye recommendations; (3) methods used for education & communications & (4) recommendations for improving care	*"In our study, without prompting the participant with preconceived questions, financial burdens emerged as major barriers."* *"Physicians cited patient knowledge about diabetes as the most important barrier to eye care. Most patients believed that they had adequate education about diabetes, but focus group data indicated a gap between the perceived communication from physician to patient and what the patient understood."*	EC&R Knowledge
Hatef (2015)[18] (Published)	USA No specific setting	Modifiable factors assessed to increased likelihood of completion (e.g. financial incentives)	N/a	N/a
Heisler (2003)[19] (Published)	USA	Association between patients' assessment of their DM self-management & receiving an eye examination	N/a	N/a
Hipwell (2014)[20] (Published)	UK	Perceived antecedents to attendance & non-attendance at DRS	*"Getting to and from screening appointments was important pragmatically for many patients, who had to overcome a range of issues".* *"However, in another important finding, regular and non-regular patients experienced severe pain, blurred vision and debilitating photosensitivity for several hours. Interestingly, none of the health*	EC&R Belief about consequences Knowledge

			professionals except the optometrist raised this, suggesting they were unaware of this issue." *"In an important new finding, we uncovered confusion between routine retinal photography at optometry practices during eye examinations and DRS"*.	
Hossen (2015)[21] (Unpublished - Abstract only)	Bangladesh	Reported barriers to DRS - reasons for refusal	*" The main reason for refusal was that retinal photos taken might worsen sight or they were too busy to attend the clinic"*.	Beliefs about consequences EC&R
Hurrell & Donohoe (2012)[22] (Unpublished report)	UK	Identified motivations and barriers to screening and ideas for improving DRS	*"A preference for more local delivery of services is evident, especially from those who are required to attend multiple appointments. This was raised specifically with regard to both secondary care and DRS screening non-attendance."*	EC&R
Hwang (2015)[23] (Published)	Canada	Association between eye screening & reports of discussion of diabetic complications with HCPs & private insurance	N/a	N/a
Jingi (2014)[24] (Published-abstract only)	Cameroon	Associations between modifiable factors and eye care utilization	N/a	N/a
John (2014)[25] (Published)	UK	(1) Understanding about DRS; (2) encountered barriers; (3) social network conversations regarding DRS; (4) recommendations of how to increase DRS	"*The findings suggest that lack of understanding is a significant factor in low attendance rates."*	Knowledge
Jones (2011)[26] (Published - abstract only)	UK	Associations between practice-related factors & uptake of DRS	N/a	N/a
Karter (2003)[27] (Published**)**	USA	The associations between higher out-of-pocket costs and lower use of annual dilated eye exams	N/a	N/a
Khandekar (2011)[28] (Published)	Oman	Reported reasons from patients with DR for their non-attendance – reported to eye care staff	*"Defaulting patients stated that the main barriers to presenting for an appointment were lack of transport, lack of awareness regarding the risk of blindness, fear of laser treatment and*	EC&R Knowledge Emotions Social influences

			absence/reluctance of the decision maker in the family for the proposed management".	
Kiran (2013)[29] (Published)	Canada	The association between delisting of routine eye examinations and DRS attendance	N/a	N/a
Kizor-Alaraiwe (2016)[30]	Africa	Reported reasons for not having had a prior screening exam.	The major reason for not having had a prior screening is 'no one referred me for it' (31 participants, 44.3 %).	Social Influence
Kovarik (2016)[31] (Published)	USA	Reported barriers to eye examinations	*"Frequently reported barriers to ophthalmic examinations included lack of transportation and physical disability."*	EC&R Beliefs about capabilities
Lake (2017)[32] (Published)	Australia	Reported themes relating to barriers and enabler to DRS uptake	Authors provide a list of identified TDF domains. No expression of importance	N/a
Laver (2013)[33] (Published - abstract only)	UK	Reported factors that influence non-attendance	*"Participants' desire to obtain reassurance that their eyes were healthy was the only identified incentive to attend screening."*	Beliefs about consequences MADP EC&R
Lee (2014)[34] (Published)	USA	The association between distance to eye screening facility & quality of access to public transport with compliance with dilated eye examination	N/a	N/a
Lee (2000)[35] (Published)	Australia	Reported reasons for non-compliance among people diagnosed with DR	Authors provide a list of reported reasons. No expression of importance provided.	N/a
Lewis (2007)[36] (Published)	UK	Knowledge, beliefs, attitudes, social norms and reported enabling factors that may influence attendance at eye clinics	*"Family attitudes were important to patients. In some families with a strong family history of diabetes, there was considerable understanding and support. By contrast non-attendees reported their families did not understand the necessity for repeated clinic attendances."* *"Both patients and providers identified lack of awareness as the greatest barrier to attendance. However, the deficits in knowledge*	Social influences Knowledge

			were quite specific. Patients knew diabetes could affect the eyes, but were not aware that it could lead to blindness, and that even severe disease could be asymptomatic."	
Lindenmeyer (2014)[37] (Published)	UK	Reported factors relating to screening uptake	Authors provided factors associated with screening attendance. No expression of importance given	N/a
Livingstone (1998)[38] (Published)	Australia	Recommendations of types of strategies needed to promote the eye screening service	*"Five focus groups were conducted. The discussions highlighted that a great deal could be achieved by using local community networks to promote the benefits of early detection of diabetic retinopathy and local screening program."*	Social influences
Lu (2016)[39] (Published)	USA	Reported barriers	*"However, our survey data do suggest that Hispanic and African American patients may be affected by different psychological barriers (upset/depression in Hispanics vs. fear/discomfort in AAs). The latter might contribute to the discrepancy in screening rates."*	Emotions Beliefs about consequences
Lu (2016b)[40] (Published)	USA	Reported barriers	*"Financial burdens (26%) and depression (22%) were most commonly reported by patients as barriers"*	EC&R Emotions
Mackenzie (2015)[41] (Unpublished - Poster abstract only)	UK	Reported barriers & motivations	*"The main expressed motivating factors was:* "Identify problems early" The main expressed barriers was: *"No barriers to attendance"*	Beliefs about consequences
Massaro (2010)[42] (Published)	USA	Reported barriers to annual ophthalmic examinations, patients' perspectives of DM & digital scans	"*There was no one factor that the majority of the patients perceived as the greatest limiting factor to getting an annual eye examination."*	N/a
Moreton (2017)[43] (Published)	UK	The association between primary care practice level variables & uptake of diabetic retinopathy screening	N/a	N/a
Moss (1995)[44] (Published)	USA	Reported barriers and enablers to compliance	"*In those not having an eye examination, 79% and 71% of the younger- and older-onset groups, respectively, reported not having had one because they had no problems with their eyes".*	MADP

Mumba (2007)[45] (Published)	Africa	Reported modifiable factors associated with having had a dilated fundus exam (i.e. Knowledge).	Taken from a table: Top barrier was reported as: *(76.6%)* reported that they didn't realize that annual examination was important	Knowledge
Nathaniel (2015)[46] (Published)	Africa	The association between reported modifiable factors and having had a dilated fundus exam	*N/a*	N/a
Njambi (2012)[47] (Published)	Kenya	Reported barriers to uptake	*"Only 29% of the patients had prior eye examination, with majority (84%) citing lack of awareness as the main hindrance."*	Knowledge
Onakpoya (2010)[48] (Published)	Nigeria	Reported reasons for no previous dilated eye exams	*"Lack of eye problems and lack of referral for eye screening were the leading reasons given by patients who had not had previous dilated eye examination in this study."*	MADP EC&R
Orton (2013)[49] (Published)	UK	Reported barriers to uptake	No expression of importance	N/a
Paksin-Hall (2013)[50] (Published)	USA	Modifiable variables: The relationship between a history of attendance at diabetic management class and attendance at annual dilated eye exam	N/a	N/a
Pasagian-Macaulay (1997)[51] (Published)	USA	Reported barriers to receiving recommended ophthalmic screening	*"The respondents indicated that there were many barriers to obtaining a dilated eye exam. The long waiting time in the clinic or doctor's office was cited as a common problem."*	EC&R
Peek (2010)[52] (Published - abstract only)	USA	The association between PD and prior eye exam interval	N/a	N/a
Peng (1994)[53] (Unpublished PhD thesis)	Taiwan	(1) The association between reported modifiable factors & receipt of DR exam (2) Reported reasons given for non-attendance &	*"Regarding why participants did not have fundus checkup during the past year (Table 4.7), having no idea of that it was necessary was the major reason (43.2%)"*	Knowledge
Puent (2004)[54] (Published)	USA	Reported reasons (barriers) for non-compliance	Taken from a table: Top reasons given. *"Transfer of care to another eye doctor"*.	MADP

Rajput (2015)[55] (Published - abstract only)	USA	Reported barriers to exams and suggested interventions to improve compliance	Top reason taken from two bar charts: Top reasons given *"Lack of understanding of insurance benefits" (Patient)* *"Lower priority to other things a patient with diabetes has to deal with." (HCP)*	Knowledge MADP
Roy (2004)[56] (Published)	USA	Reported reasons for not having an eye exam by an Ophthalmologist during previous year The association between reported modifiable factors and having a dilated eye exam	*"The 2 most common reasons given for not seeing an ophthalmologist during the previous year were not having any eye problem (57.6%) and cost (23%)."*	MADP EC&R
Sachdeva (2012)[57] (Published)	UK	Reported reasons for non-attendance at DRS	*"The most common reason given was that individuals thought that DR screening appointments were unnecessary if they were already attending appointments with an optometrist or ophthalmologist (22%)."*	MADP
Schoenfeld (2001)[58] (Published)	USA	The association between reported modifiable factors and non-adherence	N/a	N/a
Sheppler (2014)[59] (Published)	USA	The association between reported modifiable factors and non-adherence	N/a	N/a
Shukla (2016)[60] (Published)	India	Reported barriers in accessing care for DR	*Among those reporting barriers, the distance was the most important barrier (n = 114,65.1%)*	EC&R
Silver (2006)[61] (Published)	USA	Barriers to receiving or accessing diabetes-related eye healthcare & motivators for behaviour change	*"Most focus group participants in this study, in particular the younger ones, did not understand the connection between their diabetes and eye related problems (a long-term consequence of diabetes). They therefore agreed on the importance of a health campaign communicating the connection between diabetes and DED and the need for regular eye exams."*	Knowledge
Strutton (2015)[62] (Published)	UK	Explanations for why patients had never attended a screening appointment	Importance not expressed.	N/a

Tapp (2004)[63] (Published)	Australia No specific setting	The association between reported modifiable factors and regular screening	N/a	N/a
Van Eijk (2012)[64] (Published)	The Netherlands	The association between barriers/incentives and attendance	*"Patients reported 'knowledge of detrimental effects of DR on visual acuity', 'sense of duty' and 'fear of impaired vision' as main incentives. The main barrier was the absence of a recommendation by the health-care provider."*	Knowledge Social influences Emotions
Walker et al (1997)[65] (Published)	USA	Reported Incentives and barriers	*"The incentives "having eye problems" and "doctor said it was important to go" each had 91% responding it was an incentive to go for a DFE."Only about one-third agreed that any particular item was a barriers to receiving a DFE (e.g. economic factors).*	Social influences MADP EC&R
Wang (2010)[66] (Published)	China	The association between reported modifiable factors & having an eye exam	N/a	N/a
Will (1994)[67] (Published)	USA	The association between reported modifiable factors and having an eye exam	N/a	N/a
Yuan (2007)[68] (Unpublished MSc dissertation)	China	The barriers to access eye care services.	*"Lack of awareness as the main barriers to eye care services among diabetic patients was declared by this study".* *"No recommendation to patients to see eye doctor by physician also was other important barriers in this study".*	Knowledge Social influences
Yuen (2012)[69] (Published)	USA No specific setting	The association between reported modifiable factors and having an eye exam	N/a	N/a
Zhang (2009)[70] (Published)	USA	The association between receiving eye care education and receipt of dilated eye exam	N/a	N/a

EC&R = Environmental Context & Resources; MADP = Memory, Attention & Decision Processes.; DR = Diabetic Retinopathy; DRS = Diabetic Retinopathy Screening

Appendix S8. Details of domains (and corresponding themes) that were considered less important

The content themes in the domains that were not identified as factors of high importance in influencing screening attendance are described in further detail in the sections below.

Goals (Total = 13 studies)

Theme: Goal priorities (12 studies)

Some regular attenders prioritised the health of their eyes and it was this prioritization that motivated them to attend screening (Hipwell et al., 2014; Mackenzie et al., 2015; Njambi, 2013). In two studies, people with diabetes explained that this priority was linked to their family. One person explained: *"I want my vision because I want to see my grandchildren"* (Walker et al., 1997) and a single mother explained; "*ultimately if I lose my vision, it's going to affect everybody, so I had to make it [screening] a high priority"* (Lake et al., 2017). For others, it was a desire to stay in control of their health (Walker et al., 1997). However, for others eye health was not always a priority (Kovarik et al., 2016; Roy, 2004; Schoenfeld et al., 2001). This lack of priority was linked to the burden of having diabetes and the expectation of attending multiple appointments (Applebee, 2012; Fisher et al., 2016; John et al., 2014). One HCP was quoted as saying: *"Having diabetes is very hard work and the patient has to have a lot of incentives to actively comply with everything that is expected of them"* (Applebee, 2012).

***Social professional role and identity* (Total = 11 studies)**

Theme: Illness identity (6 studies)

Some people with diabetes communicated that they did not identify with having diabetes. Both people with diabetes and HCPs reasoned that some people might be in denial and had not yet accepted that they have been diagnosed with diabetes (Cano, 2007; Hipwell et al., 2014; Puent & Nichols, 2004; Strutton et al., 2016). Others felt uncomfortable with identifying as a person with diabetes. One young person expressed how they found it difficult to attend diabetes related groups as the others were so much older than they were, and they did not feel they fitted in (Lake et al., 2017). In another study, a person with diabetes explained that they just

wanted to be treated as normal: *"I can't help it. I don't like being diabetic…I am as normal as anybody else; I can do what anybody else can do"* (Lewis et al., 2007).

Theme: HCPs role in diabetic retinopathy screening (3 studies)

Some people with diabetes and/or HCP expressed a wish for HCPs to take more responsibility and to have more direct input, by actively making a screening appointment for them (Buonaccorso, 1999; Hipwell et al., 2014; Peng, 2010) as it was argued by a HCP in one study that expecting people to make their own DRS appointment downgraded its perceived importance (Hipwell et al., 2014). Furthermore, in one study a person with diabetes argued that it was the HCPs responsibility to explain the implications of their diagnoses to their patients (Hipwell et al., 2014)

***Intention* (Total = 9 studies)**

Theme: No intention to go (7 studies)

In a number of studies people with diabetes declared that the reason that they did not attend screening was because they just didn't want to go or had no interest in attending (Mackenzie et al., 2015; Massaro et al., 2010; Pasagian-Macaulay et al., 1997; Van Eijk et al., 2012). Often there was no explanation for why they did not want to attend. However, in one case a person with diabetes was quoted as saying: "*...one endocrinologist I went to just said 'do this, do that' and I did not want to. I did not understand why I needed to*" (Rajput et al., 2015)

Theme: Intention to go (3 studies)

For others, little would prevent them from attending, "*I would go no matter what, except if insurance doesn't cover it, but the Lord would provide a way*" (Walker et al., 1997). For others they intended to go but had yet to do so (Lake et al., 2017).

Beliefs about capabilities (Total 9 studies)

Theme: Physical capability to attend (9 studies)

Both people with diabetes and HCPs suggested that some people did not have the physical capability to attend screening due to a (Adriono, 2011; Kovarik et al., 2016; Van Eijk et al., 2012). Some had limited personal mobility due to poor overall health or were housebound (Puent & Nichols, 2004; Strutton et al., 2016). Additionally, if a person required physical assistance to attend but none was available, this was also noted as a barrier (Al-Alawi et al., 2016; Al-Malki, 2009; Jingi et al., 2014; D. Lee et al., 2014). In one study, it was reported that requiring an accompanying person was more likely in non-attenders than in attenders (Van Eijk et al., 2012).

Behavioural regulation **(Total 7 studies)**

Theme: (Lack of) Engagement with self-management (4 studies)

In one study the authors reported that for every 10-point increase in self-rated diabetes management the odds of receiving an eye examination increased by 16% (Heisler, Smith, Hayward, Krein, & Kerr, 2003). Both people with diabetes and HCPs noted that some people might not attend as they were disengaged with their diabetes care (Strutton et al., 2016). One HCP argued that attendance relied on people with diabetes being proactive as appointment times were not always convenient and the person may need to call up the screening service and change it (Hipwell et al., 2014). People with diabetes setting their own prompts was seen by HCPs as a positive behaviour (Applebee, 2012; Livingstone et al., 1998).

Optimism **(Total = 5 studies)**

Theme: Confident that they're eyes aren't at risk (5 studies)

Some studies reported that people with diabetes can have perceptions of 'invulnerability' or 'complacency' leading to non-compliance (Lake et al., 2017; Lu, Serpas, Genter, Anderson, et al., 2016)(Rajput et al., 2015). For example, one HCP said*; 'Some people think that if they don't go, it won't happen. Head in the sand"* (Rajput et al., 2015). One persons reason for for not go for screening was spiritual; *"God will take care of me. My eyes are okay"* (Walker et al., 1997). However, feeling optimistic was not always reported as a barrier; *"I just expect to get an all clear. That's my expectation, I go in there expecting everything to be looking pretty good and I expect something from the optometrist to say 'look, it's all great, it's on track, nothing is*

happening…"(Lake et al., 2017). For one person this confidence came from feeling that they had their blood sugar under control (Lake et al., 2017).

Reinforcement and skills

The domain 'reinforcement' was sparsely populated in terms of thematic content (e.g. themes represented with fewer than three studies.. None of the data extracted from the studies was coded into the domain 'skills' at step 2.

Appendix S9. References.

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